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Strategies to Minimize Perishable Food Loss in the Retail Grocery Business

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Walden University

College of Management and Technology

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Thankgod Chukwuemeka Aleruchi

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Walden University
2019

Abstract

Strategies to Minimize Perishable Food Loss in the Retail Grocery Business

by

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MBA, Cappella University, 2014

MBA, Webster University, 2007

BS, Clemson University, 2005

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

April 2019

Abstract

Supply chain managers in the retail grocery industry face significant challenges in reducing the wastage of perishable food. Perishable food spoilage and deterioration in the retail grocery industry result in a significant loss of profitability and consumer satisfaction. The purpose of this multiple case study was to explore the strategies that supply chain managers in the retail grocery business used to minimize perishable food loss. The perishable inventory theory was used as the conceptual framework. Data were collected from semistructured interviews with 6 Pennsylvania retail grocery supply chain managers who implemented strategies to minimize perishable food loss and from organizational documents. Data analysis was carried out using Yin's 5-step process of compiling, disassembling, reassembling, interpreting, and concluding data. The 3 emergent themes resulting from data analysis were inventory strategy, logistics and deliveries strategy, and information technology strategy. Member checking occurred after transcription and summarization of the interview data. The findings indicated that supply chain managers use first-in-first-out approaches to inventory management, rotation, replenishment, information sharing, and on-time purchasing to minimize perishable food loss. The findings and recommendations of this study might be valuable to supply chain management and retail grocery leaders to create strategic solutions to mitigate the loss of perishable food. The findings of this study might contribute to positive social change through the reduction of perishable food loss, an increased supply of food, lower retail prices to the consumer, and improved customer satisfaction.

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Dedication

I dedicated this study to my family. First, to my wife Dana, whose support and love throughout my education was my source of inspiration. Next, to my sons Matthew and Anthony, who looked at me as a role model of which I did not want to disappoint. I am so happy to have all your support.

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Section 1: Foundation of the Study

Supply chain managers in the retail grocery business experience difficulty in minimizing perishable food loss (Lukic, Kljenak, & Jovancevic, 2014). This challenge has put specific constraints on some supply chain processes, such as procurement, production planning, inventory management, and distribution (Ali, Madaan, Chan, & Kannan, 2013). Managing perishability presents some important challenges in supply chain management, but the most difficult task for supply chain managers is inventory management (He & Wang, 2012). Ali et al. (2013) noted that supply chain managers have numerous inventory management models to help manage these challenges associated with perishable food loss. Effective management of perishable food requires the ability to share accurate, timely, accessible, and reliable information (Fernandes, Gouveia, & Pinho, 2013).

Background of the Problem

Because of globalization, technological advancement, and logistical capabilities, effective supply chain managers adopt integration in managing perishable foods deterioration from within the organization internal structures to outside the organization external connection that relies on the interaction of the organizations and external environments (Chen & Wei, 2012; Li, Cheang, & Lim, 2012). Perishable food is a large component of grocery retail sales, significantly affecting profitability (Li et al., 2012). To maximize profits, supply chain managers use diverse strategies to efficiently coordinate and integrate suppliers, manufacturers, and stores to ensure the production and

distribution of quality products at the right time and with enough quantity to meet customer demand (Li et al., 2012). Grocery perishable foods represent up to 50% of all sales in retail food (Chung & Li, 2013). Supply chain managers recognize that perishability is a criterion used by consumers when selecting a food retail outlet (Chung & Li, 2013). Perishable foods loss occurs because of natural deterioration and shrinkage, transportation and handling damage, improper packing, and expired sell-by dates (Lukic et al., 2014). Because of the nature of perishable food, supply chain managers use diverse methods to minimize waste in the retail grocery business (Chung & Li, 2013).

Problem Statement

Supply chain managers in the retail grocery business experience difficulty managing perishable food products because of deterioration, wastage, spoilage, and a short shelf life (Lukic et al., 2014; Wang & Lin, 2012). Operational losses attributable to perishable foods deterioration are 4.5% of the cost of perishable food or more than double the 2% loss rate of nonperishable foods (Li et al., 2012). Perishable food loss for fruits and vegetables in the United States in 2013 was approximately \$43 billion (Lukic et al., 2014). The general business problem was that perishable food spoilage and deterioration result in a significant loss of profitability. The specific business problem was that some supply chain managers in the retail grocery business lack the strategies to minimize perishable food loss.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies that some supply chain managers in the retail grocery business use to minimize perishable food loss. The target population consisted of supply chain managers in six retail grocery businesses in Western Pennsylvania because they have successfully implemented strategies to minimize perishable food loss. The findings of this study might contribute to positive social change through the reduction of perishable food loss, increased food supply, lower retail prices to the consumer, improved customer satisfaction, and safer food offerings to the consumer. Consumer prices of perishable food reflect the losses incurred by the retail grocery business (Neff, Kanter, & Vandevijvere, 2015). Ringsberg (2014) noted that there are health concerns related to the consumption of perishable food because of latent decay or contamination. Society might benefit from this study because of safer, higher quality perishable food inventories and lower retail prices.

Nature of the Study

The three research methods are qualitative, quantitative, and mixed methods (Yin, 2018). I selected the qualitative method to use open discourse for gaining the deeper meaning of the phenomenon. Qualitative researchers use open discourse and open-ended questions to discover the deeper meaning of what is occurring or has occurred (Cronin, 2014). In contrast, quantitative researchers use closed-ended questions to collect numeric data to test hypotheses among variables (Jasti & Kodali, 2014). Mixed-method

researchers use both qualitative element and quantitative elements (Frels & Onwuegbuzie, 2013; Verdinelli, 2013). I did not test hypotheses, which is part of a quantitative study or the quantitative portion of a mixed methods study. Therefore, a quantitative or a mixed-method approach was not appropriate for this study.

Yin (2018) noted that case study researchers attempt to understand complex social situations, which involve social behavior, as well as managerial and organizational processes. A multiple case study design was appropriate for this study because of the added inquiry into process standards and into the organizational environment using multiple sources of data. Researchers using a case study design rely on data from multiple sources of evidence (Yin, 2018). Phenomenological researchers develop a description in the participants' words, events, and lived experiences (Gill, 2014; Yazan, 2015). The phenomenological design is not suitable because I am not focusing on lived experiences of the participants. Ethnographic researchers focus on a set of cultural beliefs of a population group (Kahlke, 2014; Wallace & Sheldon, 2014). I am not focusing on the cultural aspects of a phenomenon; therefore, an ethnographic design is not appropriate.

Research Question

What strategies do supply chain managers in the retail grocery business use to minimize perishable food loss?

Interview Questions

The questions below are the open-ended questions for the semistructured interviews (see Appendix A).

1. What strategies do you use to minimize perishable foods loss?
2. What transportation strategies do you use to minimize perishable foods loss?
3. What inventory strategies do you use in reducing perishable food loss?
4. What information technology strategies do you use to reduce perishable food loss?
5. What key challenges did you face in implementing strategies to minimize perishable food loss?
6. How did you overcome the key challenges in implementing strategies to minimize perishable food loss?
7. Is there other information regarding strategies to minimize perishable food loss you might offer that I did not ask?

Conceptual Framework

The perishable inventory theory originated by Nahmias (1982) was the conceptual framework for the study. The key constructs and propositions underlying the theory were perishable management procedures, supply chain procedures, information technology (IT) management, and sustainability practices. Nahmias' perishable inventory theory emanated from numerous perishable inventory studies. The perishable inventory theory is the basis for analyzing the effectiveness of perishable strategies employed by supply

chain managers in introducing successful ways to reduce spoilage. The theory is used to denote how perishable foods should be managed and waste reduced (Bushuev, Guiffrida, Jaber, & Khan, 2015; Stanger, Wilding, Yates, & Cotton, 2012; Wang & Lin, 2012). Stanger et al. (2012) extended the theory by focusing on managing blood perishability in hospital settings.

For a business to succeed and remain profitable, supply chain managers need to adopt strategies that best suit their situation. Operating the business beyond their normal method requires innovative approaches to successfully managing perishable deterioration. When supply chain managers aligned their perishable food management practices with the perishable inventory theory, significant reductions in food loss occurred (Kumar, Teichman, & Timpernagel, 2012). Perishable inventory theorists offer solutions to perishable food loss such as management of perishable food waste and deterioration, supply chain management, technologies, and sustainability (Badar, Sammidi, & Gardner, 2013; Chintapalli, 2015; Stanger et al., 2012). The perishable inventory theory aligned with the purpose of this study because supply chain managers rely on inventory optimization, forecasting techniques, supply chain management, and technologies to reduce perishable loss.

Operational Definitions

Green supply chain management (GSCM): Green supply chain management is the addition of the green component to supply chain management, addressing the influence

and relationships of supply chain management to the natural environment (Koh et al., 2013).

Perishable products: Perishable products are short shelf-life products that deteriorate, decayed, or lose quality and value over time (Chintapalli, 2015; Wang & Li, 2012).

Radio frequency identification (RFID): Radio frequency identification is the automatic identification technology that uses the radio-frequency wave to transfer information and allow information sharing among supply chains (Bardaki, Kourouthanassis, & Pramadari, 2012).

Remanufacturing: Remanufacturing is the practice of value-added recovery in which used products are collected, processed, and resold (Barquet, Rozenfeld, & Forcellini, 2013).

Socially responsible organizational buying: Socially responsible organizational buying is that which attempts to consider the public consequences of organizational buying or bring about positive social change through organizational buying behavior (Hall, Matos, & Silvestre, 2012).

Supply chain management (SCM): Supply chain management is a system or approach used to effectively coordinate and integrate manufacturers, suppliers, and retailers, so that product distribution occurs at the right time and place to maximize profits for the organization (Chen & Wei, 2012).

Sustainable supply chain management (SSCM): Sustainable supply chain management is the strategic and transparent coordination and achievement of a firm's social, environmental, and economic objectives in the systemic integration of key inter-organizational business process for improving the long-term social and environmental performance of the organization and supply chains (Wolf, 2014).

Vendor-manage inventory (VMI) system: VMI system is a collaborative and information sharing strategy applied by buyers and suppliers in the retail industries to control inventory (Chen & Wei, 2012).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions are what the researcher holds to be true and based on premises in which to draw conclusions (Bloomberg & Volpe, 2012). An assumption was the participants will answer all the interview questions truthfully and completely. By using a multiple case study design, I assumed the information collected within the interviews provided useful data for answering the research question. An assumption was the instruments and techniques I use in data collection resulted in dependable, credible data. I assumed the relevant company documents were complete and accurate.

Limitations

A limitation is a potential deficiency or weakness primarily because of internal or external conditions that could restrict the study's scope (Bloomberg & Volpe, 2012). A limitation of this study was the interview data emanated from a small sample of supply

chain managers in six retail grocery stores and thus was not representative of the broader retail grocery industry. This study was restricted to supply chain managers located in Western Pennsylvania; therefore, the qualitative case study results held no generalizability. The focus of the study was limited to the loss attributed to deterioration of perishable products. In Section 3, I recommend further research to overcome the limitations.

Delimitations

Delimitation of a study, as defined by Shukla and Jharkharia (2013), are boundaries focusing on the overall scope of the study. The focus of this study was the grocery retail business that is successful in managing perishable deterioration. I excluded businesses that retailed only nonperishable grocery items. The geographic region of Western Pennsylvania was a delimitation. This research only included supply chain managers in the retail grocery business who implemented strategies to minimize perishable food loss. I excluded supply chain managers who had no successful strategies in the reduction of perishable waste within the grocery retail business at the time of the study.

Significance of the Study

Leaders in the retail grocery business remain confronted with competitive challenges, such as the loss of profit margins, increasing market maturity, and difficulty in predicting customer perception and behavior (Helm, Hegenbert, & Enders, 2013). As competition and loss of revenue continue, supply chain managers in the retail grocery

business face added challenges of managing perishable food loss. The retail grocery business remains pressured for lower prices, higher quality standards, and improved customer service (Helm et al., 2013). Gaining insight into effective strategies to minimize perishable food loss might prove valuable for retailers in the grocery business. Leaders and supply chain managers in the retail grocery business might find value in the findings of this study to improve their business practices as well as contribute to positive social change.

Contribution to Business Practice

This study may give leaders and supply chain managers insight into effective strategies to minimize perishable food loss in the retail grocery business. Through exploring the successful strategies supply chain managers use and disseminating the findings of this study, supply chain managers of retail grocery businesses might reduce perishable food loss, increase profitability, and improve customer satisfaction. Increasing the knowledge base in an industry may contribute to profit maximization (Amorim, Costa, & Almada-Lobo, 2014). Ringsberg (2014) noted that drawing attention to perishable food loss resulted in improved packaging, storing, and labeling to help mitigate food safety issues. Neff et al. (2015) noted that 30% of the global food supply and 40% of the United States food supply is lost or wasted within the supply chain or at the retail grocery business. Supply chain managers need a better model to overcome the losses associated with perishable foods (Sternbeck & Kuhn, 2014). Supply chain managers might use the findings to implement effective strategies to minimize perishable

food loss, thereby realizing improvements in profitability, delivery, logistics, and distribution in the retail grocery business.

Implications for Social Change

The findings of this study might contribute to positive social change through the reduction of perishable food loss, increased supply of food, lower retail prices to the consumer, and improved customer satisfaction. Retail grocery managers must set a price for their perishable food inventory to account for deterioration and decay (Neff et al., 2015). Perishable food is a health concern because of the possibility of human consumption of contaminated or deteriorated food stocks (Ringsberg, 2014). Leaders and supply chain managers might use the findings of this study to contribute to society by implementing strategies that result in lower food cost as well as high quality and safer perishable food sold to consumers.

A Review of the Professional and Academic Literature

In this literature review, I used journals and scholarly sources to analyze topics such as (a) perishable inventory theory (b) management of perishable foods, (c) supply chain management (SCM), (d) technology implication, and (e) sustainability factors. I researched these topics to demonstrate how organizations can compete in unpredictable environments and unstable markets while addressing uncertainty in the supply chain. Furthermore, I addressed the critical need to identify strategies that supply chain managers in the grocery business use to minimize perishable food loss. Supply chain networks provide the contemporary business environment for the retail grocery business.

These networks provide supply chain managers' unified view and control over a multitude of uncertainty, such as increased customer expectations, shorter product lifecycles, technological advances, and economics of scale (Schoenherr et al., 2012).

The conceptual framework for the study is perishable inventory theory. The basis of the theory was numerous inventory studies, which were the structure for analyzing the effectiveness of perishable strategies of supply chain managers in minimizing perishable food loss. I used search phrase parameters related to the perishable food management in the retail grocery business to discover relevant sources to support my research inquiry. The primary research of databases and libraries include the Walden University Library, Sage, Walden University Thoreau search and, Google Scholar. The EBSCOhost database afforded the most results, but I also utilized additional databases such as ProQuest, Academic Search Complete, and Business Management Source Complete. This study contains 228 sources: 220 (96%) peer-reviewed sources, four seminal textbooks, three dissertations, and one U.S. government source. The literature review also includes an analysis of different perceptions and perspectives about strategies that supply chain managers in the retail grocery business use to minimize perishable food loss. The organization of the literature review consisted of five areas: (1) perishable inventory theory, including a review of perishable inventory theories; (2) perishable management, including (a) perishability, (b) inventory control, (c) pricing, discount pricing, and ordering, and (d) product display and stock out; (3) supply chain management, including (a) perishable supply chain, (b) collaboration and integration, (c) vendors and suppliers,

(d) logistics and transportation, and (e) procurement and distribution; (4) technologies, including (a) IT and supply chain, (b) information sharing, and (c) innovation; and finally, (5) sustainability, including (a) sustainable competitive advantage, and (b) green sustainability.

Perishable Inventory Theories

Although I used Nahmias' (1982) perishable inventory theory for the conceptual framework for this study, I reviewed other theories, studies, and perspectives in literature to further analyze the perishable inventory theory. Perishable inventory theories have undergone several changes since Nahmias' research. Nahmias explained the problem involved in determining the ordering for fixed and random lifetime perishability. Nahmias, using an inventory theory methodology based on a survey with a mathematical model of a fixed life perishability and a random lifetime probability model, sought to find a solution for inventory control in the retail grocery business. The method of a fixed life perishability included deterministic and stochastic demand, while the random lifetime probability model included periodic review and exponential decay model (Nahmias, 1982).

Nahmias (1982) commented on the uncertainties in inventorying fresh produce, meat, and other perishable foods, and the processes the foods undergo before consumption. The study included two classifications of perishability: fixed life perishability and random lifetime models (Nahmias, 1982). The study was one of the first in adopting the first in first out (FIFO) and last in first out (LIFO) optimal model in

managing perishable food inventories, yet Nahmias' model or research cannot definitely confirm that FIFO or LIFO is the best model for adoption in retail grocery business. Herbon, Spiegel, and Templeman (2012) conducted a discrete event simulation that illustrates the price differentiation effect in deteriorating inventory. Herbon et al. extended their own research by incorporating simulation modeling and experimental design as related to consumers' behavior to fixed price inventory. Both Nahmias and Herbon et al. focused on reducing inventory in the retail grocery business.

The simulation modeling is based on continual price reduction, moderate price differentiation, environmental, and managerial factors while the experimental design aspect of the research focused on achieving statistical validity of differentiation rate, planning cycle, ordering quantity, and cost for selling a defective item (Herbon et al., 2012). Herbon et al. (2012) compared the effect of fixed price and discounted price policies based on the expiration date of perishable food. Herbon et al. noted that fixed price policy resulted in a 6% profit increase when the sale occurred well prior to the expiration date, but profit decreased if the sale occurred near or on the expiration date. In discounting price policy, most customers will wait for a price reduction before purchasing the item that result in profit loss for the business. Therefore, most grocery businesses no longer offer price discounts (Herbon et al., 2012).

Ali et al. (2013) discussed the logistic-based approach to inventory management of perishable products. A logistic-based approach is a system of an optimal replenishment scheduling that determines deterioration and shortage with time-adjusted value (Ali et al.,

2013). Ali et al.'s research extended the Wagner-Whitin determination of lot sizes, replenishment cycles, and schedules. Ali et al. used an optimization sensitivity analysis to solve the problem. For instance, long and short product life cycle applied effectively to a variety of logistics model to elevate the inventory problem with shortages and time decay functions (Ali et al., 2013). The optimization model incorporates varieties in order sizes, different levels of services, buying and selling habits, promotion and product discounts, and frequency of orders. Ali et al. concluded that optimal replenishment with time-adjusted value using a logistical approach would minimize deterioration and shortage of inventories. Ali et al. investigated three types of inventories: (a) short life cycle, (b) ramp-type style demand, and (c) green and sustainable products. Ali et al. also noted that a logistic model is an effective approach used for a variety of products with long and short product life cycle. Bloomfield and Kulp (2013) noted that nonoptimal inventory decisions apply to reduced inventory in the supply chain.

Durability, transit lags, and optimality of inventory management decisions were the basis for data in two laboratory experiments on a single-echelon inventory (Bloomfield & Kulp, 2013). Inventory durability and transit lags can create order volatility more than demand and can cause supply chain managers to move away from inventory *optimality* (Bloomfield & Kulp, 2013). The model causes the supply chain managers to over adjust their orders to reflect backroom holding *inventories* and backlog in inventories. A decision made outside optimal ordering may result in excess inventory, inventory shortage, and excess inventory demand volatility (Bloomfield & Kulp, 2013).

Optimal theories and perishable inventory theories are set to work and complement each other to minimize backorder and holding cost in the supply chain (Bloomfield & Kulp, 2013). Braglia, Gabbrielli, and Zammori (2013) noted that stock diffusion theory deals with a dynamic model for inventory control. The information gathered will help supply chain managers to manage inventory effectively and reduce back stock to a minimum. The main aim is to simplify the decisions regarding timing of the order and quantity of the order to meet the inventory demand as the inventory drops. Stock diffusion theory facilitates accounting for delays in the purchase or operating features in the supply chain (Braglia et al., 2013).

Ma, Wang, Che, Huang, and Xu (2013) stated that the bullwhip effect on product orders and inventory is a perspective of demand forecasting technique. Ma et al. based their research on a two-level supply chain model with the aim of demand price being sensitive. Retailers use this model to minimize the bullwhip effect on product orders and inventory (Ma et al., 2013). They concluded that demand forecasting is the cause of the bullwhip effect on products orders. Ma et al. also noted that the bullwhip effect on product orders causes missed production schedules, misguided capacity plans, and inactive transportation upstream while inventory *oscillation* results in high levels of safety stock and reduces downstream inventory cost. The three main areas of the forecast are the minimum mean-squared error technique, the moving average technique, and the exponential smoothing technique (Ma et al., 2013). Cai and Zhou (2014) also investigated an optimal policy for the perishable product on disrupted transportation or

distribution to export and support local markets. Cai and Zhou's research is built on two market scenarios: export market and local market transportation delivery disruption. Cai and Zhou applied optimal policies to minimize expected loss in make-to-order, and make-to-stock as well as numerical experiment to check optimal policies

Deliveries from export markets might result in increased variety of products, yet tend to cause more waste than local markets experience. In the retail grocery business, this enlightens the importance of transportation and distribution system in minimizing perishable loss. Retailers in the grocery business aim to market perishable products to meet consumer demand, enhance profitability, and remain competitive, yet avoid deterioration and spoilage. Although Xiao and Chen (2012) explored producers' transportation process in supply chain management of fresh products, their emphasis was to preserve freshness through distribution to the retail grocery stores. The aim is to investigate one producer and one distributor on a distant retail market based on distribution and transportation methods (Xiao & Chen, 2012). The pull and push model is used to analyze the optimal decision for the supply chain that included order quantity, shipping quantity, and retail price (Xiao & Chen, 2012). The supply chain managers adopted the pull model as the better model to improve supply chain performance, fixed inventory-plus factor (FIPF) strategy and to minimize inventory waste (Xiao & Chen, 2012). The aim is to minimize losses incurred during transportation of perishable items to the grocery stores (Xiao & Chen, 2012). Li and Chan (2012) investigated the demand disruption of manufacturing supply chain on the impact of collaborative transportation

management, using a multiagent approach to illustrate the effect of collaborative transportation management on the performance of manufacturing of supply chains. A multiagent is a computer system, situated in some environment that is capable of flexible autonomous action to meet its design objectives (Li & Chan, 2012). Supply chain managers use multiagent technology in transportation planning, for the management of risks, and virtual market within supply chains (Li & Chan, 2012). Li and Chan (2012) acknowledged that collaborative transportation management could reinforce co-operation, improve the competitive advantage, change the information sharing, and co-operation relationships within supply chain actors.

Supply chain managers minimize the problem of perishable food delivery from the origin to the retailer through collaborative transportation manufacturing. Cakanyildirim, Feng, Gan, and Sethi (2012) used the symmetric and asymmetric information to consider the coordination of buyer-vendors supply chain of perishable products. Cakanyildirim et al. used the assumption, notation, and mathematical formulation of a two-level supply chain of perishable product with stock dependent demand. Supply chain managers explored the concerns of coordination with quantity, the effects of deterioration, and information asymmetry under various conditions (Cakanyildirim et al., 2012). Cakanyildirim et al. emphasized optimizing perishable products quality discount contracts for vendors and the coordination with supply chain management (Cakanyildirim et al., 2012). Ben-Daya, Hassini, Hariga, and AlDurgam (2013) investigated a model on consignment and vendor managed inventory policy for a

single vendor and multiple buyers supply chains. Consignment is the process of a supplier placing goods at a customer location without receiving payment until after the sale of the goods (Ben-Daya et al., 2013). Supply chain managers focused on three vendors-buyers' partnerships: the independence of the vendor and buyer; the entering of vendor into vendor-managed inventory consignment partnership with buyers; and the vertical integration of the vendor and buyer firm into a single decision about the ordering policies (Ben-Daya et al., 2013). The supply chain managers' assumption is that vendors or suppliers have enough capacity resources to satisfy deliveries to buyers. Hosseini pour and Sandoh (2013) expanded the classical model of newsvendor problem focusing on the optimal business of retailers.

In Hosseini pour and Sandoh's (2013) model, an assumption is the customers are located within a close distance to their shopping establishment. The supply chain managers' assumption is that the customer would be able to purchase the right product at the right price before the product is out of stock (Hosseini pour & Sandoh, 2013). A basis for this model is the notion of retailers to locate distribution centers, and stores closer to their preferred customers (Hosseini pour & Sandoh, 2013). The supply chain managers engaged in the number of business hours necessary for a day to fulfill optimal stocking quality. Sainathan (2013) explored dynamic demand substitution, pricing, and replenishment of perishable products through reviewing the pricing and ordering processes used by a retailer selling a perishable item with a two-period shelf life for an extended period. The supply chain managers' focus is on the pricing decision between the

old and the new products, yet the price might stay the same depending on the demand (Sainathan, 2013).

Perishability challenges lie within the uncertainty of consumer demand and price changes. In mitigating the problem, supply chain managers consider optimal inventory when ordering, holding, out-of-stock, and out-of-date cost (Sainathan, 2013). The theory of constraint is a replenishment method employed by retail grocery business to maintain low inventory and at the same time maintaining high customer delivery performance level (Wu, Huang, & Jen, 2012). Wu et al. (2012) explored the replenishment of product in the supply chain. The whole aspect of the supply chain manager is to understand the replenishment frequency and the distribution or transportation plan. The idea is to link supply chain management with producers, manufacturers, suppliers, distribution centers, and on to the consumers (Wu & Sarker, 2013). Inventory replenishment implemented effectively by supply chain managers will only achieve stronger delivery satisfaction (Wu & Sarker, 2013). Wu et al. noted that supply chain managers use the model to reduce inventory level, transportation costs, increase forecast accuracy, and customer service level. Giri and Bardhan (2012) investigated supply chain coordination for deteriorating item with stock and price-dependent, using a sensitive analysis to assist supply chain managers to examine the stability of a single manufacturer and a single retailer in managing a single product in the supply chain for a finite period. The aim is to push for the optimal price of the producers and retailers to maximize the sum of the profit of the supply chain (Giri & Bardhan, 2012).

Giri and Bardhan (2012) maintained that integration and the coordination of retail grocery business and manufacturers are essential in effective perishable supply chain management. Herbon (2014) focused on comparing dynamic pricing versus acquiring information on consumer's heterogeneous sensitivity to product freshness. Herbon explored a model of applying the inventory system once a cycle to the replenishment of perishable product of which the sensitivity to perishability with a fixed shelf life is unknown to the retailer. Supply chain managers successfully used an analytical approach to redirect retailers' awareness to solve the problem and for retailers to incur profit and evaluate customers' paid price (Herbon, 2014). Herbon stated that understanding consumer's shopping behaviors would enhance customers' satisfaction and retail performance. Liao, Zequeira, and Seifert (2014) conducted research on the value of updated information on future price behavior of consumers using a model of one-period inventory with random period and two period ordering pricing. Liao et al. supported their research with three models: the static model, the quantity flexible model, and the combined quantity and timing flexible model. Supply chain managers placed more emphasis on price sensitivity and the effects of holding cost (Liao et al., 2014). Supply chain managers further compared the features in the supply chain of updated information on price behavior, dynamic pricing, and supply flexibility (Liao et al., 2014).

Morgan and Gagnon (2013) introduced the theory of systematic literature review of remanufacturing scheduling by exploring data in peer-reviewed journal articles to gain an understanding of the progress in the scheduling of remanufacturing operations. The

researchers reviewed 679 journal articles with a focus on disassembling versus integrated scheduling, single versus multiple products, inventory control, and production or aggregable planning (Morgan & Gagnon, 2013). Morgan and Gagnon noted that product deterioration is one of the complexities associated with retail grocery business. Supply chain managers preferred the Kanban model to a push model to analyze scheduling and improve performance in remanufacturing operation (Morgan & Gagnon, 2013). Feng, Zhang, and Tang (2013) investigated optimal control of production and remanufacturing for a recovery system with the perishable item. Feng et al. examined a recovery system for perishable items with an emphasis on two inventories: serviceable, and returned, recoverable items. Feng et al. noted that dynamic optimal policy is more sustainable than static optimal policy. Both studies focused on sustainability, preserving the environment and at the same time creating a competitive advantage.

Perishable Management

Perishability. Perishability is the decay, damage, evaporation, pilferage, or loss of product or loss profit that results in decreasing usefulness of the inventory (Lukic et al., 2014). Lukic et al. (2014) used perishable food data to analyze the cause of food loss in a variety of sector groups. Categories include fresh fruits and vegetables, seafood, meats, and dairy that have the significant amount of losses. Lukic et al. estimated the perishable loss in the United States of America amounted to approximately \$42 billion per year. Perishable management is the essence of supply chain managers' ability to control inventory product deterioration, spoilage, damage, and product shelf life that

contribute to loss profit (Amorim et al., 2014).

Amorim et al. (2014) examined a model used to maximize the income of manufacturer that has control of logistics and distribution division of the product. Supply chain managers use income maximization model as a tool for planning decisions for a large produce grower in northwestern Mexico. Supply chain managers applied this model in considering these factors in determining the perishability as a loss function and as a constraint for the storage. These factors included price estimation, resources availability, price dynamics, product decay, transportation, and inventory costs (Amorim et al., 2014). A tactical model for planning introduced as an integration plan for producers and distribution (Amorim et al., 2014). Supply chain managers debated on the joint pricing and perishable inventory control challenges as retailers engaged in not selling new and old inventory together (Li et al., 2012). Before replenishment, the retailer decides on if the old products can be markdown, dispose, or carry over to the next inventory period (Li et al., 2012). Supply chain managers used an efficient solution in conjunction with the fractional programming approach to mitigate these challenges. The basis for this approach is the retailers' decisions regarding discount pricing of the old inventory because of the remaining shelf life, adjusting the shelf space due to demand, and replenishment and pricing of the new inventory to avoid out-of-stock (Li et al., 2012). The aim of the retailer is to maximize the profit of the organization.

Li et al. (2012) noted that perishable foods loss greatly affected an organization's profitability. They also identified that perishable food has become a large part of grocery

retail sales. Li et al. estimated the sales to be over \$340 billion, with perishable food accounting for 64% of the shrinkage in grocery retailing. They noted that perishability shape customers' perceptions and their shopping habits (Li et al., 2012). Although perishables products account for large sales in grocery sales, perishables foods are in a constant deteriorating state (Li et al., 2012). This is because of variety, quality, and availability of perishable products being globalized (Li et al., 2012). Supply chain managers must sell perishable products before their expiration date. Li et al. identified that supply chain managers face the operational decision challenge of either discounting these products or risk the loss of a sale. A strategy employed by these supply chain managers is to introduce weekly sales and offering buy one and get one free (BOGO) to reduce or minimize perishable loss (Li et al., 2012). Supply chain managers are moving to technologies to overcome the challenges associated with the waste in perishable food inventories (Lukic et al., 2014). Some of the moves include sophisticated packaging of foods sold at groceries retail with a longer expiration date to manage the spoilage. Lukic et al. (2014) explained how organizations are dealing with the handling of perishable foods. The strategy is to reduce the postharvest losses. They noted that supply chain managers have put emphases on using coupons or double couponing to move the product off the shelves.

Managing perishables have put constraints on supply chain managers in that they have instituted strategy process to minimize perishable losses through procurement, production planning, inventory process, and distribution before the product gets to stores

(Amorim, Meyr, Almeder, & Almada-Lobo, 2013). Amorim et al. (2013) examined the planning model that manages perishability challenges in production and distribution. Supply chain managers use this framework for classifying models and attention to the importance of managing perishability in a different industry (Amorim et al., 2013). They indicated that managing perishability needs integrating information sharing throughout the organization. These processes will elevate the challenges incurred during procurement, sales, distribution, receiving and delivery, storage, inventory management, and traceability of perishable foods. This process helped the supply chain managers pay attention to opportunities for achieving efficiency and consumer satisfaction. For instance, supply chain managers are buying perishable products per demand, bulk, and less on products that are not moving faster to maintain variety and reduce waste (Li et al., 2012). Customer satisfaction is a primary concern for supply chain managers (Amorim et al., 2013). To mitigate this concern, managers are ordering perishable foods just to meet the sales and stock-outs as well as ordering products with longer shelf life in an effort to reduce spoilage (Amorim et al., 2013).

As identified by Amorim et al. (2013), logistics experts manage perishability through distribution planning. Distribution planning considers the frequency of delivery due to demand (Rijkema, Rossi, & van de Vorst, 2014). Supply chain managers use distribution planning to control inventory, freshness, and to achieve better customer service. To achieve this plan, organizations have diverse ways to locate distribution centers or warehouses close to manufacturing plants and stores. This strategy helps in

reducing transportation cost, perishability wastage, and increases the freshness of the products (Li & Chan, 2012). Replenishment is another strategy employed by supply chain managers to make sure perishable foods are fresh when they arrive at the stores (Amorim et al., 2013). Frequent replenishment reduces the stock-out and keeps the products fresh for the customers. In the process of managing perishable, supply chain managers have changed the product allocation process whereby selling items get more shelf spaces than less selling products. Li et al. (2012) identified first-in-first-out (FIFO) as a strategy used by supply chain managers to control inventory and manage perishable freshness. This process used by distribution centers and stores to make the certain old product is out to the stores and to the customers.

Amorim et al. (2014) noted that supply chain managers use a monitoring strategy to ensure safe transport of perishable foods from the production stage to the customers. This strategy is to ensure freshness, reduce waste, and ensure the delivery of quality products to the customers. Supply chain managers should use monitoring of the transportation routes and delivery schedules to help maintain the freshness and quality of perishable products (Amorim et al., 2014). Rijpkema et al. (2014) explained the difficulty supply chain managers experience providing year-round availability of fresh products to the retail stores. Rijpkema et al. examined international strawberry sourcing in the supply chain, collecting data through interviewing several fresh fruit distributors that operate in Belgium and Egypt. Rijpkema et al. identified effective strategies distribution managers used to receive, inventory, and transport perishable food to the retailers with excellent

quality and low rates of spoilage. Temperature control monitoring throughout the supply chain was the primary strategy to ensure quality and reduce spoilage (Rijkema et al., 2014). Because of globalization and seasonal availability of the perishable products, supply chain managers used this strategy to minimize the waste, starting at the harvest and extending through delivery to the retail stores (Rijkema et al., 2014).

Eroglu, Williams, and Waller (2013) illustrated the backroom effect of managing perishable foods. A backroom effect model includes consideration of case size, shelf space, and reorders point in deciding replenishment (Eroglu et al., 2013). Eroglu et al. argued that when supply chain managers order products without adequate retail shelf space, they increase the need for backroom storage as well as increase the probability of spoilage and waste. Supply chain managers must consider customer demand and space allocation before placing any order (Eroglu et al., 2013).

Some supply chain managers based their replenishment on the price of the item, not on customer demand; therefore, increasing the chances of product deterioration. Isada and Isada (2014) examined the long-term contribution to profitability by internalizing externalities of private enterprises. The research aim was to show that sustainability activity of private enterprises contributes to profit in long-term basis (Isada & Isada, 2014). Isada and Isada applied a statistical verification based on sustainability statement. This strategy is to verify quantitatively the relationship between sustainability and profitability in the fresh food industry. Isada and Isada explained the effect of organization venturing outside of their usual norms. Wal-Mart is an example of an

organization that opened stores outside United State to increase their profitability, but most of all, to be able to compete in the global market (Isada & Isada, 2014). The idea is to be close to the seasonal raw material or products, monitoring the harvest, and delivering the products to the stores in good condition (Isada & Isada, 2014). Narasimhan and Schoenherr (2012) examined the role of integrated supply management practices and environmental management practices as factors of actual and perceived quality, collecting data from 434 manufacturing plant managers as well as data from the Global Manufacturing Research Group to use data from different countries. Narasimhan and Schoenberr found that quality management is a key issue in a competitive environment and an essential element of gaining a competitive advantage. Publix supermarket is an example of an organization that used quality management within all their business dealing. Their management of perishable food is reflective of their customer base because they buy the best quality products and set the price based on the quality. Effective quality management leads to quality performance and improved customer satisfaction (Narasimhan & Schoenherr, 2012). Supply chain managers' ability to manage returns is a way to minimize perishable waste (Chen & Bell, 2013). Chen and Bell (2013) examined customer returns with emphasis on manufacturers and retailers' absence of information sharing. This model used by supply chain management to find the impact of customer returns information decisions in supply chain and profit when a manufacturer supply one product and a retailer is faced with two forms of customer returns (Chen & Bell, 2013).

They noted that customer returns reduce the profit of the organization and affects inventory management.

Chen and Bell (2013) noted that customer returns to retailers average 7.32 % of gross sales per year. Chen and Bell indicated that customer returns to Wal-Mart average \$6 billion annually. These, especially in grocery retailing, end up as waste and loss of profit because of out-of-date, damaged, or reduced shelf life of the products. However, Shukla and Jharkharia (2013) insisted that the best strategy is to focus on customer satisfaction and profit maximization with waste minimization as a key element of the strategy. Shukla and Jharkharia explored the literature of managing the supply chain of fresh produce in a systematical analysis of literature from 1989 to 2009. As globalization, technological innovation, and environmental concern in mind, Shukla and Jharkharia examined the constraints in post-harvest and the delivery of the products to the stores as a means of deteriorations minimization. Supply chain management's concerns are to see the technological innovation applied to forecasting, scheduling planning, and transportation to elevate the worries of supply chain managers in their replenishment efforts (Shukla & Jharkharia, 2013). Products dates expiration of perishable has been the major issues to supply chain managers (Kaipia, Popovska, & Loikkanen, 2012).

Kaipia et al. (2012) explored three fresh food supply chains, namely: milk, fresh fish, and fresh poultry, in the Nordic countries. Data emanated from interviewing supply chain managers and companies' database records. Kaipia et al. analyzed information sharing and flow patterns such as current orders patterns, forecasting, planning process,

and material flow based on supply chain structure. Their findings indicated the need for more emphasis on information sharing to support ordering per demand, inventory support of the vendors, recognizing the availability of products, and the means of reaching those products (Kaipia et al., 2012). Kaipia et al. emphasized collaboration and integration as major hurdles in managing perishable products. Antelo, Passot, Fonseca, Trelea, and Alonso (2012), in a quantitative study, investigated multilevel model approach toward optimal operation conditions of freeze-drying processes. Building on the investigation, Antelo et al.'s model integrated operational design and control of a freeze-drying process that combined dynamic modeling with efficient optimized off-line and on-line control. Antelo et al. noted that freeze-drying offered an attractive dehydration method for perishable products from deterioration. The supply chain used the framework developed as a useful systematic tool for the offline and online optimal operation policies for a variety of fresh and biological products.

Antelo et al. (2012) noted that higher levels of controlled to better inventory cycle times and a reduction in deterioration and spoilage in fresh produce and perishable products. In a qualitative case study of fruit, a highly perishable product, Carvalho, Thome, and Leitao (2014) explored quality management as a resource for transaction costs reduction. Carvalho et al. interviewed 19 Brazilian fruit exporters and 15 U.K. fruit importers. Carvalho et al. conducted semistructured interviews in addition to secondary data analysis and direct observation of six different fruits: melons, grapes, mangoes, papayas, oranges, and apples. Out of the analysis conducted on the Brazilian exporters

and U.K. importers, Carvalho et al. identified that there seem to be no perceived technical problems related to the fruit quality management of each type of fruit. Although that quality consciousness is fundamental in the fruit trade, firms that are incapable of maintaining quality issues successfully will find difficulty earning a profit in fruit trade (Carvalho et al., 2014). Carvalho et al. further identified that transactions cost economics used to decrease transaction costs with quality management as an instrument.

Carvalho et al. (2014) suggested future research to bring more understanding to quality management. Ouma (2012) explored the creating and maintaining of global connections of a multinational fruit processing company in Ghana. Ouma observed Tango fruits and other agro-business firms associated with cutting and packaging of fruits from harvest in their country of origin. Ouma noted that retailers used the just-in-time inventory system in their production and marketing of pineapples, mangoes, coconuts, papayas, and passion fruits as well as juice produced in Ghana.

Spiess, Lund, and Mercer (2013), in a qualitative case study, explored the strategies leaders used to strengthen food security in rural areas of developing countries. Spiess et al. observed the leaders in four case studies in the country of Tanzania. The International Union of Food Science and Technology is an organization devoted to broadening food security and introducing science and technology to the central African nation (Spiess et al., 2013). The organization has developed four measures that consisted of demonstration sites, education, training, and technology transfer. The organization is set up to improve food knowledge and security, curb hunger and malnutrition, and

develop a supply chain to meet the global demand for food. Improvements in minimizing perishable food loss should help The International Union of Food Science and Technology organization in meeting its mission objectives.

Inventory control. Perishable inventory control is always the concern of supply chain managers and the most difficult to control by the retail grocery manager (Lau, Nakandala, & Shum, 2016). The difficulty of control is because of the limited shelf life of the products, which pose risks of deterioration. Wastage and spoilage of perishable items contribute to not only production cost, disposal cost, and loss of profit, but add to cost because of time wasted inspecting, grading, sorting, and discarding deteriorated products. Lau et al. (2016), who developed the N-period dynamic deterministic inventory model for perishable goods, argued that the model would assist supply chain managers in deciding the optimal ordering quantity and reduce inventory cost. A vendor-managed inventory system (VMI) is a collaborative and information sharing model used by suppliers and retailers to control their inventory (Chen & Wei, 2012). Suppliers and retailers use VMI for a better understanding of sales data, thereby allowing the application of better demand forecasting, inventory reduction strategies, increased inventory replenishment, increased customers' satisfaction, and improved profitability. Numerous organizations such as Wal-Mart, Costco, Kmart, and Campbell Soup have used VMI as a strategic partnership in their business strategy to coordinate their inventory control (Chen & Wei, 2012).

Supply chain managers experience exposure to different uncertainties because of resources availabilities, inbound and outbound resources, and demand changes

(Fernandes et al., 2013). As the uncertainties grow because of competitions, products variety, globalization, and an increase in capital cost, supply chain managers remain challenged to reduce inventory and minimize waste. Fernandes et al. (2013) commented on using reliable, timely, accessible, accurate, and valid information on the supply chain to control and minimize waste in the inventory. To control inventory, supply chain managers have adopted replenishment strategies (Wang & Lin, 2012). In a quantitative survey study of retailers in the two-echelon supply chain, Wang and Lin (2012) analyzed the optimal replenishment strategy for products experiencing deterioration because of a continuous decrease in market demand and price changes. Wang and Lin noted that market demand decreased as the perishable products' age increased, yet prices decreased in an attempt to sell the products. Wang and Lin recommended instituting price changes because of customer demand, with the goal to reach an optimal replenishment strategy to maximize the retailer's profit and to reduce the deterioration of the product.

Another strategy is to order or replenish products per availability, demand, and shelf space. Implementing the strategy requires multiple deliveries of products using a quasi-just-in-time inventory system to reduce shelf stocks as well as time on the shelf until purchased by the consumer (Wang & Lin, 2012). This strategy will only be successful through effective collaboration with the suppliers (Wang & Lin, 2012). Wang and Lin (2012) noted that product deterioration is time-sensitive, and that price and replenishment strategies of the retailers have an impact on inventories management. Effective inventory control is to get the right product at right time to the right place and

in good condition (Ali et al., 2013). The idea is for supply chain managers to establish a strategy to determine when and how to order so that inventory meets the demand of the customers and eliminate out-of-stock. He and Wang (2012) examined the deterioration of perishable inventory with constant consumer demand. Their goal was to understand why products with constant demand deteriorated. The finding of their study was that retailers over-ordered perishable products or overestimated consumer demand (He & Wang, 2012).

Drezner and Scott (2013) considered the effect of distribution location on perishable inventory management. Drezner and Scott indicated that the location of a distribution center is a source of inventory control. The objective is for the supply chain managers to locate distribution centers near or central to manufacturers and stores. Delivering products to the stores multiple times in a week and reducing the distance traveled by trucks reduces spoilage during transit and increases the product life. Jovanoski, Minovski, Lichtenegger, and Voessner (2013) compared the issues of first-in, first-out (FIFO) and last-in, first-out (LIFO) as an aspect of the inventory control. Supply chain managers use this process in the grocery retail business to maintain daily inventory management (Giri & Bardhan, 2015).

Ioannidis, Jouini, Economopoulos, and Kouikoglou (2013) acknowledged that controlling inventory at the production line helps extend the life cycle of a product. The aim is to introduce a make-to-order process in the retail grocery business through production of products based on consumer demand. Choudhary and Tripathi (2012)

echoed the process in which customer demand reflects the retail orders, supplier orders, and inventory backlogs. Choudhary and Tripathi also suggested adjusting the inventory schedule when demand is lacking to reduce shrinkage. Although limited shelf life exists in perishable products, these methods tend to cause large back stock inventories, increased holding costs, and large inventory stocks with expiration dates (Olsson, 2014). Stanger et al. (2012) identified computer-assisted ordering as a means of eliminating overestimation of stocks levels. This process is to assist the supply chain managers in controlling inventories that minimize waste and spoilage of perishable foods.

Pricing, discount pricing, and ordering. Pricing, discounting, and order is a major way of eliminating excess inventories (Han, Oh, & Hwang, 2012). Discount pricing is a method applied by supply chain managers to unsold or large inventories to minimize or decrease the inventory before the expiration date. Wang and Li (2012) noted that the quality of the products effects the pricing, ordering, and discarding of perishables. Regarding products close to the end of their shelf life, managers either discount the price or risk losing all revenue associated with the product (Wang & Li, 2012). Another way price impacts perishability is the collaboration between supply chain managers with vendors or suppliers of the products in that lower wholesale prices tend to create additional demand from retailers, yet additional retailer demand does not extend the shelf life of the products (Golhar & Banerjee, 2013). Supply chain managers should order perishable products based on consumer demand, not discounted wholesaler prices (Golhar & Banerjee, 2013).

Chung and Li (2013) dealt with the effect of a multiperiod pricing strategy aimed at stabilizing consumer demand using dynamic pricing models for perishable products. Because most customers prefer looking for the freshness and expiration date of a product, the discounting price did not make a difference in the purchasing habit (Chung & Li, 2013). Han et al. (2012) claimed that the best practice is either to separate the products or identify the items with a special pricing method that will show which products are discounted or not and let the customer make their choice. Supply chain managers adopt price changes to reduce backroom inventories (Olsson, 2014). Produce managers tend to discount prices when inventory exceeds customer demand. Meng, Grant, and Fernie (2013) noted that some customers recognize that produce managers will discount prices; therefore, purchase only after the price decreases.

Product display and stock outs. Out-of-stock and on-shelf availability are a challenge retail groceries face in their replenishment of the perishable products (Meng et al., 2013). In a qualitative case study of improving on-shelf availability, Meng et al. (2013) explored how retailers measure on-shelf availability and solve out-of-stock problems by interviewing 36 retailers in Edinburgh, Scotland. Meng et al. found that the retailers enjoyed approximately 95% on-shelf availability of perishable food inventories, yet stock-outs commonly occurred in the majority of the different varieties offered. Han et al. (2012) noted that on-shelf availability increased and stock-outs decreased through accurate forecasting of consumer demand as well as training of the staff who were in charge of the perishable food displays. Chung and Li (2015) recommended that retailers

improve staff training to lower stock-outs, increase product quality, and improve customer satisfaction with the product displays. Customers' reaction to out-of-stock or poor on-shelf availability is not favorable to the perishable grocery retail organization (Meng et al., 2013).

When stock-outs occur on a regular basis, customers tend to shop at other grocery retail stores. Frequent stock-outs of perishable foods is the reason for 37% of customers switching to other stores, causing up to 65% reduced sales in the perishable food department (Meng et al., 2013). To improve, supply chain managers need to order and replenish products based on customer demand. Displaying the right products at the right time and price is a critical aspect of meeting customer demand and avoiding out-of-stock products (Meng et al., 2013). Chung and Li (2015) noted that some managers at grocery retail stores buy in large quantities to have massive displays in an attempt to impress consumers. Overstocked displays of perishable products might help avoid stock-outs, yet without using customer demand as the basis for the inventory, deterioration of the product quality occurs over time (Chung & Erhun, 2013).

The supply chain managers who developed collaborative relationships with the wholesalers of perishable food experienced fewer stock-outs (Kumar & Nambirajan, 2013). Chung and Erhun (2013) noted that frequent and on-time delivery of products reduced stock-outs and improved the display appearance of perishable foods. Supply chain manager use displays as a means to attract customers and to display freshness of

products; therefore, close collaboration between suppliers and retailers is essential to reducing stock-outs and improving the display appearance (Chung & Erhun, 2013).

Supply Chain Management

Perishable supply chain. Because of globalization and international trade, perishable foods arrive at grocery stores from sources located throughout the world (Janvier-James, 2012). The supply chain is a set of entities that includes manufacturers, suppliers, distributors, retailers, transportations, and logistics service providers engaged in providing goods to consumers (Janvier-James, 2012). Kumar and Nambirajan (2013) examined the concerns of 255 supply chain managers in manufacturing industries using principal component analysis, K-mean clustering, and discriminate analysis. The concerns of the supply chain managers were how to build a competitive advantage from other supply chains in the wake of a lack of sophisticated information systems and an inability to manage supply chain inventories (Kumar & Nambirajan, 2013). The most frequent concern of the supply chain managers was the lack of cooperation among supply chain partners. SCM is a set of strategies used to efficiently integrate the organizational entities such as manufactures, distributions, suppliers, and stores so that products are produced and supplied in the right quantities to the right places and at the right time to minimize cost while satisfying service level (Kumar & Nambirajan, 2013).

Company leaders use SCM to integrate entire organizational systems to improve efficiency, quality of service, and inventory control as well as lowering costs (Janvier-James, 2012). Swoboda and Elsner (2013) examined how successful retailers integrate

core elements of retailing perishable products with peripheral elements such a waste reduction during the supply chain process. Swoboda and Elsner surveyed 102 international retailers and conducted in-depth, face-to-face interview with 126 executives' retailers from Austria, Germany, and Switzerland. Retailers use standardized, core process, yet benefit from integrating efficiency up and down the supply chain through improved delivery of goods, waste reduction, and lower costs (Swoboda & Elsner, 2013). Shukla and Jharkharia (2013) explained that retailing fresh produce requires extensive supply chain management and integration of effective logistics throughout the supply network. Janvier-James (2012) echoed the sentiment that supply chain managers must focus on quality and timely delivery of perishable products, waste reduction, customer satisfaction, and profit maximization. The perishable product supply chain is complex, presents logistics experts unique challenges regarding moving fresh products from the farm to the consumer without incurring damage or deterioration. Globalization within the perishable food industry increases the complexity of the perishable food supply chain.

Because of globalization, products encounter deterioration, short shelf life, contaminations; all creating compromised safety conditions for consumers (Shukla & Jharkharia, 2013). Shukla and Jharkharia (2013) acknowledged that globalization has enabled fresh produce that is not usually available in United States grocery stores available for the consumers. Shukla and Jharkharia also noted that globalization has brought information sharing and integration of suppliers, buyers, and farmers into the

market. The complexity of SCM occurs because of consumer's demand for products variety, healthy choices, fresh, and cheap produce availability in the grocery stores. Simangunsong, Hendry, and Stevenson (2012) identified the uncertainty in managing supply chain networks. The frustration supply chain managers have is finding ways to minimize the complexity and uncertainty in the wake of global supply chain networks that result in delivery delays and quality issues (Simangunsong et al., 2012). The uncertainty measures are the inefficiencies regarding waste reduction. The inefficiencies occur because of operational difficulties associated with storage, handling, and transportation of fresh produce (Shukla & Jharkharia, 2013). The major problem is the relaxed method of predicting and estimating waste and the lack of infrastructure for the process in most of these developing countries (Shukla & Jharkharia, 2013).

External and internal uncertainties hamper supply chain management (Simangunsong et al., 2012). Internal uncertainties include the internal manufacturing process, decision complexity, supplier interactions, the order forecast horizon, and IT and information system complexity, while the external uncertainties include the environment, government regulations, and competitor behavior (Simangunsong et al., 2012). Because of the uncertain environments, Marchi, Erdmann, and Rodriguez (2014) claimed that a complex systems approach is an addition to new understandings of management of supply chain networks. The system aids supply chain managers to work together through partnerships to exchange worth of knowledge and capabilities. Supply chain organizations design their networks to enable them to meet every supply chain

responsibility (Hasani, Zegordi, & Nikbakhsh, 2012). In a competitive environment, the need for collaboration and cooperation exist to respond to customers fluctuating demand, manufacturing, and distributing processes.

Collaboration and integration. SCM is a strategic philosophy aimed at a collaborative effort to align all the supply chain into a unified entity (Chen, Sohal, & Prajogo, 2013). Supply chain collaboration is an engagement between two or more organizations in which managers adopt a long-term perspective of working collaboratively to create a unique structure that neither can be accomplished alone (Chen et al., 2013). Because of the risks associated with SCM, supply chain managers have adopted collaborative and integrative approaches to mitigate supply chain risks. Chen et al. (2013) identified areas of collaboration, such as supplier, customer, and internal collaborations used to mitigate supply chain risks. Shen and Yu (2012) noted that effective purchasing is a great competency, essential to supply chain management success. Organizational leaders and managers who leverage their suppliers' capabilities tend to improve in terms of effective fulfillment of their core competencies (Shen & Yu, 2012). Effective use of SCM is a way organizational leaders mitigate operational and disruptive risks (Chen et al., 2013). Collaboration within the SCM process is successful when the outbound and inbound logistics are coordinated with each other.

Communication and information sharing is an essential component of effective SCM. In a quantitative survey study, Wang, Tai, and Grover (2013) examined the relational benefits of improved interfirm information processing capability in buying-

supplier dyads. Wang et al. used cross-sectional, mailed surveys to gather data from randomly selected large and medium-sized manufacturing firms in Taiwan. A structural equation modeling with partial least squares performed a simultaneous evaluation of both measurement model and structural model (Wang et al., 2013). Wang et al. found that with the effective exchange of information, the mitigation of supply chain uncertainty occurred through synchronized preplanning activities throughout the supply chain. Shen and Yu (2012) noted that the ability of supply chain managers to integrate, build, and reconfigure interfirm competencies in the event of uncertainty is an advantage to performance. Wang et al. noted that the supply chain process improves with collaboration among all parties, yet Shen and Yu alluded to the competitive nature of the grocery, noting that forming strategic alliances against competitors reduces supply chain collaboration. Bosona, Nordmark, Gebresenbet, and Ljungberg (2013) recommended the integration of supply chain networks of local food producers, suppliers, distributors, customers, and the community to boost the competitiveness of grocery stores selling perishable products. Bosona et al. noted that integrating the supply chain of local food producers tends to result in minimizing deterioration of perishable foods.

Integration of supply chain partners reduces transportation-related waste of perishable foods (Bosona et al., 2013). Bosona et al. (2013) noted that the relocation of perishable food distribution centers nearer to the retailers reduces waste; 64% waste reduction attributable to reduced delivery time; and 74% waste reduction attributable to less distance traveled. Kumar, Singh, and Shankar (2013) argued that small and medium

enterprises should engage in collaboration to leverage resources to improve SCM implementation, coordination, and flexibility.

Co, David, Feng, and Patuwo (2012) explored a continuous-review model for dual intercontinental and domestic outsourcing. Co et al. argued that outsourcing decisions made by an organizational leader should consider the direct and most visible supply chain cost, yet should also include indirect or hidden costs. Effective leaders in the supply chain seek to increase the visibility of all processes as well as all costs (Kumar et al., 2013). International outsourcing might result in lower production costs, yet causes an increase in shipping cost as well as extending the delivery time from the original source to the retail store (Co et al., 2012). Supply chain leaders recognize that international outsourcing increases the probability of supply chain disruptions; therefore, might inhibit the retailer's ability to satisfy market demands of consumers as well as increase costs (Co et al., 2012).

Supply chain disruptions result in added costs because of the need to increase inventories, rearrange production and shipping schedules, engage in excessive back ordering, and resort to other modes of transportation to deliver the goods (Omar, Davis-Sramek, Meyer, & Mentzer, 2012). Organizational leaders who seek to reduce supply chain disruptions integrate their internal operation into their external supply environment by creating successful relationships with supply chain partners (Omar et al., 2012). To have an effective supply chain, logistics managers use global supplier integration to build relationships and create a competitive advantage. Global supplier integration results in the creation of new opportunities for business leaders to enter new markets, outsource to

international suppliers, and extend their brand identity (Omar et al., 2012). Omar et al. (2012) commented on how operational integration and collaboration allows for better alignment with the global supply chain and synchronization of the transactions, materials movement, and order processes. Gu and Gao (2012) noted that joint decision-making between the buyer and supplier is an essential element of global supplier integration. Wu and Sarker (2013) discussed the advantages of an integrated inventory policy between the buyer and supplier to improve logistics and lower costs. Cooperation between all supply chain parties is a critical component of improving the stability and competitive power of supply chain partners (Wu & Sarker, 2013).

Many organizations are now adopting an integrated inventory policy to increase profits and minimize the joint total cost of the supply chain (Wu & Sarker, 2013). Wal-Mart uses collaborative planning forecasting and an integrated inventory model to manage their inventories (Wu & Sarker, 2013). Wu and Sarker (2013) indicated that the use of this strategy resulted in a 10% wholesale product cost reduction for Wal-Mart. With more collaboration and integration, supply chain managers experienced a decrease in inventory storage costs as well as less deterioration of perishable products (Wu & Sarker, 2013). In agreement with Wu and Sarker, Yao (2013) noted that collaboration between all actors in the supply chain regarding scheduling, ordering, forecasting, and shipping is an effective strategy to lower cost and improve product quality. Tsao (2013) discussed the positive benefits of designing an integrated supply chain network, noting better replenishment cycles, improved product freshness, lower costs, and improve

consumer satisfaction. Elkady, Moizer, and Liu (2014) suggested that supply chain managers select collaborative partners based on the commonality of their products to align their logistics processes for improved product flow from the farm to the retailer. Yan, Shi, Ye, Zhou, and Shi (2015) added that integrating technology into the inventory strategy is an effective means to improve forecasting, product monitoring, and lower supply chain costs.

Vendors and suppliers. Vendor-managed inventory (VMI) is a collaborative system adopted by suppliers and supply chain managers to coordinate the inventory process (Borade, Kannan, & Bansod, 2013). In a VMI strategy, the suppliers or the vendors decide on the retailer's inventory and the replenishment schedule. This process helps the retailers minimize stock-outs and reduce the cost of holding excess inventory. Vendors and supply chain managers use IT to facilitate implementing the VMI process (Borade et al., 2013). The use of IT aids the vendors and supply chain managers in providing actual sales of products, inventory on hand, and promotions to better serve the customers. Wal-Mart is a successful organization known for adopting the VMI model to lower costs and improve inventory management (Borade et al., 2013). Alftan, Kaipia, Loikkanen, and Spens (2015) noted that the introduction of a quick response strategy enhanced the partnership with the retailers and suppliers to respond more efficiently to consumer demands. Thome, Hollmann, and Scavarda do Carmo (2014) noted that collaboration between vendors and buyers is the key to successful supply chain management. A supply chain manager who wants lower inventories, reduced wastage,

less deterioration of perishable, shorter lead times, and customer loyalty should invest in a VMI strategy (Thome et al., 2014). Anderson and Parker (2013) noted that integrating a VMI strategy in the supply chain leads to increased organizational efficiency.

Glock (2012) commented that strong relationships between suppliers and retailers lead to reduced ordering and inventory cost through processes such as just-in-time inventory management or frequent delivery in the grocery business regarding perishable food products. Supply chain managers use the VMI model for joint decision making with vendors, replenishment scheduling, quality management, and pricing strategies (Chen & Wei, 2012).

Logistics and transportation. Effective logistics is a strategic objective of an organization to make products available from the production through retailing to consumption (Hadas, Stachowiak, & Cyplik, 2014). Hadas et al. (2014) stated that the logistics strategy is to support the organizational goal; therefore, the logistics strategy affects the strategic decisions on the logistics entities such as warehouses, distribution centers, IT processes, inventory management, suppliers, and customers. Transportation is the means of transporting products from the producers to the retailing market (Xiao & Chen, 2012). Xiao and Chen (2012) investigated the optimal decisions for supply chain managers regarding order quality, shipping quality, and retail price, using a pull model and a push model. In using the pull model, the distributor or retailer places an order based on inventory levels; the supplier fills the order (Xiao & Chen, 2012). The push model starts when the producer ships a batch of products to a distant wholesale market and the

distributor purchases and resells to end users (Xiao & Chen, 2012). Hadas et al. (2014) suggested that perishability of products during transportation creates great challenges for companies regardless if using a pull or push model. Xiao and Chen noted that supply chain managers experience less spoilage and waste using the pull model.

Supply chain managers use different means of transporting and distributing their products either by themselves or through a third-party logistics provider. Xiao and Chen (2012) indicated that perishability is an area in which supply chain managers need to focus their attention when selecting means of delivering their products to market. Supply chain managers must select the appropriate means for delivery to meet customers' requirements, ensure on-time deliveries, improve the delivery cycle, reduce logistics costs, improve quality, and reduce waste and spoilage (Hadas et al., 2014; Xiao & Chen, 2012).

Hadas et al. (2014) and Xiao and Chen (2012) noted that product deterioration that incurs during transportation affects the price as well as inventory decisions. The location of warehouses and distribution centers in relation to the retail stores affects perishability (Lichocik & Sadowski, 2013). To improve logistics regarding transport of perishable products, supply chain managers seek suppliers with distribution facilities near the retail locations (Lichocik & Sadowski, 2013). Transportation planning is an essential component of supply chain logistics in that ensuring the delivery of high quality products is a planned activity between supply chain managers and the transportation provider (Lichocik & Sadowski, 2013). Sharif, Irani, Love, and Kamal (2012) suggested that

coordination between transportation providers and supply chain managers is a critical element of perishable food logistics.

Xiao and Chen (2012) noted that collaboration between supply chain managers and transportation management is an effective strategy to improve logistics, reduce delivery times, and reduce deterioration of perishable food. Li et al. (2012) stated that firms spend about 42% of their budget on logistics. Li et al. noted that for effective collaboration between logistics parties, a high level of trust between all actors exists. The need exists for open communication, mutual respect, and a willingness between all parties to support a unified strategy of delivering high quality perishable products to the consumer (Li et al., 2012).

Das (2012) commented that logistics planners should integrate reverse logistics in supply chain management, including collection, recovery, remanufacturing, and redistribution of recovered products. The increase in globalization resulted in reduced product life cycles, yet globalization created longer delivery times (Diabat, Govindan, & Panicker, 2012). Supply chain managers must recognize the benefits of reverse logistics to reduce costs and ensure product quality (Diabat et al., 2012). Globalization might lead to increased availability of goods from distant markets, yet places additional challenges on supply chain managers in the perishable food industry.

Procurement and distribution. Procurement is a strategic planning practice engaged by organizational personnel in targeting and developing long-term relationships and alliances with supply chain partners to achieve cost saving and a competitive

advantage (Schoenherr et al., 2012). Distribution is a supply chain process that encompasses storage of inventories of products used to replenish retail stores and meet customers demand (Azoury & Miyaoka, 2013). Jaca, Santos, Errasti, and Viles (2012) explored successful *lean* improvement in the retail distribution of goods and services to customers, noting the critical element of strategy implementation through worker engagement. Implementing a lean strategy in the procurement and distribution process required leaders to change the attitudes of workers through communication and training, yet use the expertise of the workers for identifying areas of improvement (Jaca et al., 2012). Reducing waste in the supply chain through lean initiatives resulted in improved distribution processes, lower costs, and a lower rate of produce spoilage (Jaca et al., 2012).

Schoenherr et al. (2012) emphasized the critical aspects of effective purchasing and procurement for a company to gain a competitive advantage. The ever-changing customers' expectations, heightened competition, increased demand for varieties of products, and technology advancements enhanced the challenges encountered by purchasing managers (Schoenherr et al., 2012). Effective procurement is a collaborative effort between supply chain partners. Al-Karaghoul, Ghoneim, Sharif, and Dwivedi (2013) emphasized the importance of knowledge and information sharing between purchasing and distribution managers and the upstream and downstream supply chain partners. Supply chain manager must manage the knowledge and information gleaned

from all supply chain actors to improve operational efficiency and procure high quality products for the consumer.

Supply chain managers leverage their competitiveness by purchasing in a large quantity (Terpend & Krause, 2015), yet must consider the challenges of storing perishable foods until ordered by the retailer (Azoury & Miyaoka, 2013). Prior to purchasing perishable food in bulk to reduce cost, managers should have a plan in place for proper storage as well as an accurate forecast for market demand for the products (Azoury & Miyaoka, 2013). De Koster, Le-Duc, and Zaerpour (2012) noted the importance of properly fitted warehouses or distribution centers in the supply of perishable food products. Bulk purchasing of perishable foods reduces initial cost, yet requires effective storage practices prior to becoming a profitable strategy.

The operating expenses of a food distribution center are approximately 60% labor and transportation, and 40% overhead (de Koster et al., 2012). Distribution center managers reduce their operating expenses by locating close the source of products as well as close to the retailers to minimize transportation costs, inventory-holding time, and spoilage (Azoury & Miyaoka, 2013). Mangiaracina, Song, and Perego (2015) emphasized that logistical improvements exists when the distribution center locates in near proximity to the supplier and the buyer; therefore, supplier selection as well as distribution center location are important strategic considerations. Azoury and Miyaoka (2013) noted that supplier selection is strategic activity undertaken in the procurement and distribution phases of perishable products, especially because raw materials account for

approximately 50% of final product cost. Procurement, distribution, and delivery scheduling processes improve when central distribution centers for perishable foods locate near the suppliers as well as near the customer.

Purchasing managers for perishable food typically order from distribution centers to replenish retail inventories. Sakawa, Nishizaki, Matsui, and Hayashida (2013) indicated that distribution centers account for 80% of vegetables and 60% of fruit delivered to retail stores in Japan. Zu and Kaynak (2012) contended that national and global retailers lower costs, improve quality, and reduce retail stock-outs through owning their distribution centers; therefore, eliminating the wholesalers. Removing a *link* in the supply chain by eliminating a wholesaler is a strategy to improve supply chain coordination and visibility, reduce dependency on external actors, and improve the flow of perishable products (Zu & Kaynak, 2012).

Technologies

Information technology and supply chain. Technologies have transformed the perishable food supply chain (Tang & Zimmerman, 2013). Organizational leaders have implemented various IT initiatives to improve logistics and reduce supply chain cost (Tang & Zimmerman, 2013). The integration of IT into the operational aspects of the supply chain have improved supply chain managers' collaboration, trust, and commitment with partners (Dolci & Macada, 2014). Dolci and Macada (2014) conducted a mixed method study regarding the integration of IT within supply chain governance to improve performance, collecting data from 38 executives in six global companies. Dolci

and Macada suggested that the supply chain performance improves using IT within the financial, operational, and marketing aspects of the supply chain. Improved cooperation, collaboration, and communication in the perishable foods supply chain occurs when leaders integrate IT within the supply chain (Dolci & Macada, 2014).

Leaders improve the value of the supply chain with the integration of IT, fostering relationships, mutually beneficial information sharing, improved visibility, and common goal attainment (Rai, Pavlou, Im, & Du, 2012). For instance, leaders at Hewlett Packard and United Parcel Service created added relationship value and fostered cooperation because of an integrated IT strategy to improve the flow of goods and information within the two organizations (Rai et al., 2012). Rai et al. (2012) noted that improved relationships resulted in reduced stock-outs, lower inventory costs, and improved ability of supply chain leader to respond to a changing competitive environment.

A logistics platform is a strategic framework that supply chain managers use to create advanced infrastructure for distributing and transporting perishable foods (Varella & Goncalves, 2013). Varella and Goncalves (2013) noted that IT was the key element within effective logistics platforms. Loke, Downe, Sambasivan, and Khalid (2012), in agreement with Varella and Goncalves, commented that integrating IT within the supply chain is the means to create logistics platforms because technology replaces many of the antiquated methods of handling, transporting, and storing products. Rai et al. (2012) noted the value of logistics platforms such as Electronic Data Interchange, Radio-Frequency Identification (RFID), Warehouse Management System, and Enterprise

Resources Planning. Supply chain managers use logistics platforms to minimize perishable food waste and spoilage, reduce handling and transportation costs, and improve the delivery time (Varella & Goncalves, 2013).

Loke et al. (2012) explained that integrating IT into total quality management (TQM) strategies affect leadership, strategic planning, customer satisfaction, information analysis, people management, and process management. Loke et al. surveyed managers in 202 Malaysian manufacturing and service organizations, finding a significant link between IT integration, knowledge management, and TQM. Weigelt (2013) noted that integrating IT into TQM and knowledge management practices increases knowledge creation, performance, and profitability. Weigelt stressed the need for IT capabilities to integrate suppliers and supply chain managers to achieving a common goal. Insourcing and outsourcing capabilities of local suppliers improves through the integration of IT in TQM practices (Weigelt, 2013). Rai et al. (2012) stated that insourcing leads to complementary effects between supplier IT capabilities and client operational capabilities.

The strategy to integrate IT into management and supplier processes requires the implementer to reflect on the organizational members' skills, knowledge, and ability to execute the business strategy. Xue, Zhang, Ling, and Zhao (2013) expressed concern with the risks of integrating an IT system with suppliers or external entities. The risks of transferring organizational knowledge or proprietary information to external parties exists, yet without cooperation and collaboration with suppliers, the links in the supply

chain break down (Xue et al., 2013). Xue et al. commented that using the risk mitigation strategy of avoiding the dissemination of proprietary information as well as avoiding allowing suppliers to control purchasing and inventory decisions helps reduce the risks. Leaders should implement effective IT governance protocols and internal controls to manage the flow of knowledge to external parties (Wang et al., 2013).

Leaders remain concerned about the risk of integrating IT capabilities with the suppliers' networks such as building the system, the transfer of closely held information, and the uncertainties in contracting with external parties (Mellat-Parast & Spillan, 2014). Wang et al. (2013) stated that buyers and suppliers benefit from improved IT visibility, uncertainties exists with the supply chain. In a quantitative survey study, Wang et al. examined the relational benefits of improved interfirm information processing capability in buying-supplier dyads, noting that the effective exchange of information within supply chain partners occurs through synchronized preplanning activities by all stakeholders. Mellat-Parast and Spillan (2014) noted that the ability of supply chain managers to integrate, build, and reconfigure interfirm competencies reduces uncertainty and improves performance.

Leaders should ensure effective coordination between the buyer and supplier when integrating IT into the supply chain network (Wang et al., 2013). Mellat-Parast and Spillan (2014) noted that supply chain managers using IT experienced strong improvements in performance, shorter fulfillment lead times, supply chain flexibility, and enhanced agility in business operations. Mishra and Chan (2012) posited that integrating

IT within supplier networks is a means to improve the management as well as the quality and flow of perishable foods. Corallo, Lazoi, and Secundo (2012) noted that buyers and suppliers benefit from an integrated IT network because of improved supply chain visibility and the exchange of vital information in a timely manner.

Information sharing. Supply chain managers use IT for information sharing and improved collaboration between supply chain partners (Wu et al., 2012). Retailers face inefficiencies in coordinating the information of producers and suppliers in the supply chain (Ebrahim-Khanjari, Hopp, & Iravani, 2012). The inefficiencies are apparent during consumer demand forecasting (Ebrahim-Khanjari et al., 2012). Wu et al. (2012) noted that organizational leaders pool their resources to create a collaborative, information-sharing network. An organizational leader should decide what type of information to share as well as evaluate the risk associated with sharing the data. Information sharing should be selective depending on the competition and partners (Wu et al., 2012). Leaders should base information sharing decisions on the aspect needed to enhance a collaborative process, yet avoid sharing more than required to facilitate the process (Wu et al., 2012). Ebrahim-Khanjari et al. (2012) indicated that trust between the supply chain partners is the essential component of information sharing for a mutually beneficial outcome.

Wu et al. (2012) indicated that organizational leaders who implemented collaborative planning, forecasting, and replenishment, and VMI systems with partners enjoy the benefits of supply chain information forecasting on demand, cost, and inventory

reduction. This information sharing process results in reduced supply chain costs, faster and cheaper order processing, and improved inventory management. Wong, Lai, and Cheng (2012) stated that information sharing is essential to the success of supply chain management because partners need quality and timely information to compete in the global marketplace. Voigt and Inderfurth (2012) concurred with Wong et al., commenting that organizations without information integration and IT networks aligned with supply chain partners lack the visibility and knowledge to manage the supply chain. Voigt and Inderfurth indicated that a successful supply chain management, supplier integration, and information sharing requires a high degree of trust and transparency. Information sharing is a main driver in improving supply chain performance (Voigt & Inderfurth, 2012). Forman (2014) argued that information sharing is the best instrument for purchasing managers to make a better decision. Transparency within information sharing is an essential component for effective decision-making (Forman, 2014). Agrawal and Vijayvargy (2013) insisted on the establishment of mutual collaboration and integration of the departments to foster information collection and improved communication flow.

The integration of technology into the supply chain in the form of communication and information sharing has changed the landscape of the inbound and outbound supply chain of perishable food products. Badar et al. (2013) explored the effects of IT integration and information sharing on the bullwhip effect or amplification of overages and shortages in the supply chain, finding that integrated buyer-supplier networks experienced a reduction in the bullwhip effect. Agrawal, De Meyer, and Van

Wassenhove (2014) noted the importance of information sharing in deciding which resources to outsource or insource by supply chain managers. Supply chain managers use information sharing to act during the uncertainties and to fill the gap needed to operate a successful business (Agrawal et al., 2014). Dong, Huang, Sinha, and Xu (2014) expressed doubt in truthful information sharing of business intelligence in supply chain partners that is not publicly available or collaborated with the third party, yet noted the need for collaborative planning and decision making. Montoya-Torres and Ortiz-Vargas (2014) noted that the effective strategy for improving global performance is through information sharing and coordination of supply chain partners. A strategic concern of the supply chain managers is how to gather and disseminate the required information to all stakeholder in pursuit of a common goal (Montoya-Torres & Ortiz-Vargas, 2014).

Montoya-Torres and Ortiz-Vargas (2014) noted that information sharing is a collaborative strategy for participants within the supply chain to agree to invest resources, share information and responsibilities, and jointly make decision to solve problems. Arnold, Benford, Hampton, and Sutton (2014) emphasized how global organizational leader form alliances while mitigating the risks regarding the vulnerability of information sharing. Sharing institutional knowledge, skills, and information through alliances with trusted partners is a means for leaders to improve their competitive position (Arnold et al., 2014). In India, supply chain managers integrated information and communication technologies into all aspect of supply chain management to improve the supply of perishable foods (Parwez, 2014). Parwez (2014) noted that the flow of information across

the supply chain constitutes an integral component required for gaining efficiency in agriculture and the delivery of fresh produce to the retailers. The sustainability of the agriculture industry remains dependent on an efficient supply chain (Parwez, 2014). London and Singh (2013), in agreement with Parwez, noted that information and knowledge sharing throughout the supply chain helps the sustainability of perishable food industry.

Innovation. Organizational leaders engage in strategic activities that will earn them a competitive advantage and profitability. Tseng, Lim, and Wong (2015) noted that a competitive advantage is the outcome of an organizational leader's ability to create values exceeding the industry standard and with strong differences in their products from other company. Supply chain managers improve their competitive advantage through integrating innovation IT strategies into their logistics processes (Tseng et al., 2015). Supply chain managers experience challenges in attempting to ensure the safety and quality of perishable food (Zelbst, Green, Sower, & Abshire, 2014). Perishable foods such as meat, produce, fish, and milk move through numerous suppliers prior to reaching the customers, oftentimes resulting in deterioration, spoilage, and contamination of the products. Perishable foods are a global commodity, leading to elevated supply chain risks (Zelbst et al., 2014). Perishable foods imported by businesses in the United States increased from \$36 billion to more than \$70 billion, which account for 60% of all fresh fruits and vegetables from over 150 countries (Zelbst et al., 2014). Food safety issues such as contamination outbreaks, E. coli, and salmonella result in approximately \$500

million annual losses to growers, processors, restaurants, and grocers (Tseng et al., 2015).).

Organizational leaders seek innovative technologies to advance their business in the complex, global supply chain environment (Mavengere, 2013). Mavengere (2013) explored the role of information systems for strategic agility in a supply chain setting. Supply chain managers found that the information systems of business intelligence and enterprise resources planning systems to best support strategic agility (Mavengere, 2013). Tseng et al. (2015) noted that the use of information systems contributes to the required knowledge and strategies needed to gain or maintain a competitive advantage. Innovation is a strategic process business leaders use to gain a competitive advantage and introduce new products to the market. Many leaders use innovative technologies to improve strategic agility to respond with speed, ease, and nimbleness to changing business environment (Mavengere, 2013).

Many organizational leaders rely on IT to customize their product innovation to the customers' preference as well as to market, produce, and sell their products at a competitive price (Jitpaiboon, Dobrzykowski, Ragu-Nathan, & Vonderembse, 2013). Jitpaiboon et al. (2013) acknowledged the need for IT in the innovative collaboration with suppliers in the attempt to share accurate and timely information related to product design, delivery schedules, product improvements, strategic goals, operational performance, and customization goals of the parties involved. Kumar, Heustis, and Graham (2015) noted the increased use of track-and-trace technology in the perishable

foods industry. The purpose of track-and-trace technology is to allow supply chain managers a means to detect where their products are coming from and the expected delivery time to the distribution center, and to detect problems regarding product quality or safety (Kumar et al., 2015). Supply chain managers need to gain access to the origin and destination routing of transportation or shipping to capture and prevent issues relating to shelf life, expiration, best buy dates to ensure the safety of food supply chain (Kumar et al., 2015).

Supply chain managers use RFID technology to improve the efficiency and accuracy of the data capturing process in the grocery retail business (Lao, Choy, Ho, & Yam, 2012). Logistics experts use RFID technology to collect the vast amount of data needed to ensure the safety of perishables food moving through the supply chain (Bardaki et al., 2012). Bardaki et al. (2012) noted that supply chain leaders use RFID technology in the delivery, promotion, and pricing of perishable foods. Lao et al. (2012) commented that supply chain managers deploy RFID technology to design, develop, evaluate, and manage the supply chain. Managers of the perishable food supply chain use temperature-sensing and data-logging RFID technology for capturing information about the conditions of the perishable products traveling from the farm to the retailer (Bardaki et al., 2012). Distribution center managers use RFID technology to monitor inventories and manage the flow of perishable foods from receiving to shipping (Lao et al., 2012).

Bardaki et al. (2012) indicated that RFID technology is a data collection process that provides accurate information required to make the right decisions at right time to

ensure safe handling of food, minimize spoilage, and reduce temperature related incidents before the food reaches the grocery stores. Global positioning satellite (GPS) technology coupled with RFID technology is an excellent innovative technology for identifying the location of a product; therefore, improving the track-and-trace process (Bardaki et al., 2012). Supply chain managers use GPS and RFID technology for enhanced visibility of the supply process, timely tracking, and improving product safety and quality (Zelbst et al., 2014). Logistics experts improve productivity using GPS and RFID technology by acquiring the data faster and cheaper while reducing operating cost, responding faster to customer demand, and reducing perishable losses and shrinkage (Zelbst et al., 2014).

Sustainability

Sustainable competitive advantage. Sustainability is a process an organization can use to improve their environmental and social policies in supply chain management (Hall et al., 2012). Supply chain managers are always in search of better ways to satisfy their stakeholders (Hall et al., 2012). Barquet et al. (2013) examined the popularity of remanufacturing that requires leaders to rethink their supply chain systems, and explore new avenues for the coordination of forward and reverse supply chains that transform existing supply chain systems into closed-loop system chain systems. Barquet et al. defined remanufacturing as the process of recovery and reprocessing of materials, components, and products for reuse. Hall et al. (2012) elaborated on how several issues encountered in remanufacturing created operational challenges when specifying guidelines for inventory and production planning for closed-loop supply chain systems.

Barquet et al (2013) categorized the modeling of demand and return processes into deterministic and stochastic problems. By identifying the important modeling parameters that influenced the complexity of the modeling, they proceeded to suggest comprehensive classifications of current work associated to the modeling parameters. Barquet et al. suggested new avenues of research in international and production parameters that will aid in the practical implementation of remanufacturing. Supply chain managers and their organizations have adopted corporate responsibility as a strategic formula to pursue sustainable policies and gain a competitive advantage in the process (Carbone, Moatti, & Wood, 2012). Carbone et al. (2012) explored the diffusion of sustainable supply chain management at the interorganizational and interorganization levels. Carbone et al. built on business practice diffusion principals with the aim to classify the different mechanisms for sustainable supply chain management. Morali and Searcy (2013) noted that leaders implement proactive upstream initiatives in sustainable supply chain management more easily than downstream initiatives. Hall et al. (2012) also stated that diffusion of initiatives occurs at a cultural level surrounded by normative values, ideas, and principles.

Carbone et al. (2012) noted that organizational leaders develop policies to integrate corporate responsibility and environmentally social issues to gain a competitive advantage. The integration of sustainability principles into the supply chain management has been a strategic policy shift for many supply chain managers (Morali & Searcy, 2013). The strategic policy shift is the ability to integrate core business principles such as

procurement, logistics, marketing, operations, and knowledge management into the corporate goal of sustainability (Morali & Searcy, 2013). Hall et al. (2012) noted that integration in the supply chain would not be possible without a collaborative and trustworthy effort. Li (2013) contended that recycling and remanufacturing is a key component to product lifecycle and minimizing waste. De Marchi, Di Maria, and Micelli (2013) suggested that organizations localize their environmental concerns to gain competitive advantage and maintain a sustainable economy. De Marchi et al. also noted that organizations use *green* supply chain management to integrate environmental strategies. Green supply chain management involves a redesign of waste management, green operations, and product design, which encourages improvement in environmental performance for their suppliers (De Marchi et al., 2013). Muller, Vermeulen, and Glasbergen (2012) argued that a firm's organizational culture and values reflect their business strategic initiatives. Adopting a sustainable strategy remains dependent on the value the organization puts on the environmental concerns or initiatives of the future (Muller et al., 2012).

Organizational leaders often change their sustainable supply chain management strategic process because of external pressure (Wolf, 2014). For instance, external pressure caused Nestle Corporation to change their buying habit with palm oil suppliers in rainforest region (Wolf, 2014). Wolf (2014) also contended that stakeholder influence affects corporate sustainability strategies. Changes occur because organizational leaders do not want their brand or reputation tarnished. Carbone et al. (2012) noted that leaders

implement sustainability strategies because of regulations, competitors, scandals, and stakeholders' expectations. In implementing corporate social responsibility initiatives, leaders improve the relationship with all their stakeholders instead of pursuing short-term profits (Isada & Isada, 2014). In the effort to promote sustainability and environmental initiatives, company leaders engage in innovation and quality improvement (Isada & Isada, 2014). Stank, Esper, Crook, and Autry (2012) noted that leaders, in the effort to create value, sustainability, and competitive advantage tend to pursue cost leadership or differentiation strategies. The focus of these strategies are operational efficiency, customer satisfaction, and cost control that align with the organizational values. Machado, Scavarda, and Vaccaro (2014) indicated that organizational leaders seeking improved sustainability prefer lean and agile supply chain strategies. In using lean and agile strategies, leaders focus on reducing waste, flexibility in responding to customers' demand, value creation, and maintaining a competitive advantage (Machado et al., 2014).

Green sustainability initiative. Koh et al. (2013) defined green supply chain management as the addition of green elements to supply chain management, emphasizing the influence and relationships of supply chain management to the natural environment. Retail business leaders in the grocery industries have adopted green sustainability as a driving force in the supply chain reduction of carbon footprint (Maras, 2014). Food logistics organizations are instituting green initiatives to reduce cost, waste, energy, and emission to the air (Maras, 2014). For instance, organizations such as IFCO, JustFoodERP, Kane Is Able, and US Perishable Inc. invested in green initiatives to create

values, sustainability, and a competitive advantage (Maras, 2014). Koh et al. noted that a green supply chain is not sustainable without a collaborative understanding of the environmental impact of the supply chain. Wang and Chan (2013) confirmed that green supply chain initiatives create serious concerns, but if implemented correctly will generate opportunities and new ways of doing business. Some of the concerns include an increase in the cost of materials, marketing, employees, and manufacturing. Business leaders might gain new ways of making decisions, technologies, production processes, packaging, logistics, and operational efficiencies (Wang & Chan, 2013). Mishra, Kumar, and Chan (2012) indicated that organizational leaders use recycling and reverse logistics to meet their green supply chain obligations.

Sharma, Mithas, and Kankanhalli (2014) found that supply chain managers use IT in implementing green initiatives as well competitive decision making. Managers use IT to enhance their ability to gather historical information about their competitors, predict the outcomes of implemented initiatives, forecast consumer behaviors, and set prices (Sharma et al., 2014). Nicolae, Florin, and Vlad (2013) indicated that leaders use IT to share information and communicate globally with consumer and suppliers across countries.

Value creation occurs through integrating different organizational operations to influence the cost of labor or price of products (Tseng et al., 2015). Some of the strategies for value chain creation include procurement, logistics, and suppliers. De Marchi et al. (2013) stated that organizational leaders engaged in improving environmental

performance and green energy strategies focus on cost reductions and environmental transformation. Leaders create value chains by providing products to its customers in a timely manner (Tseng et al., 2015). The supply chain organization also creates value chains by huge purchasing power (Tseng et al., 2015). De Marchi et al. (2013) suggested that organization changed the way they view value chains because of globalization and the environment concerns of the products. An organization can differentiate itself by the uniqueness of its product or activities (Tseng et al., 2015). Differentiation occurs when an organization set itself apart from other competitors through either products or buying power. Effective implementation of green strategies is a differentiation strategy.

Leaders engage in information management and information sharing to inform their customers about the new product. Cardoso, Portela, and Dias (2013) noted that customers associate themselves with a company because of the organization's product brand. The consumers' loyalty depends on the brand quality. Leaders use marketing to create strong ties between consumers and brands identities, by using IT and packaging to disseminate or make available the products to consumers (Cardoso et al., 2013). Cardoso et al. (2013) found that consumer use the price of a produce to help judge the quality of a brand. Tseng et al. (2015), in agreement with Cardoso, noted that customers associate high prices with high quality and low prices with low quality. Implementing a green strategy might cause increased prices, yet consumers perceive the products to be of higher quality.

Tseng et al. (2015) noted that reverse logistics in the supply chain is a movement created to recapture values and proper disposal of product waste. Tseng et al. suggested that reverse logistics of the end-life products is a benefit for the natural environment as well as the company's goodwill. Irina, Liviu, and Ioana (2012) noted that organizational leaders embracing corporate social responsibility understand that managing the environmental impact of operations occurs in the same manner as managing the company's economic and commercial performance. Irina et al. suggested that life-cycle analysis is a proper tool to apply in the product design process as well as reverse logistics. Kumar et al. (2012) argued that effective reverse logistics and waste reduction are sources of a competitive advantage.

The implementation of green technology contributes to the creation of a competitive advantage (Zauskova, Bobovnický, & Madlenak, 2013). Zauskova et al. (2013) suggested that supply chain leaders must effectively manage technology to be able to adjust to customers' needs and changing market. Veneti, Maditinos, and Sevic (2012) noted that the convergence of IT and business performance accelerated innovative green strategies. This acceleration has called for innovation-driven structural change and for the organization to recruit talented employees to help develop and implement the strategies (Zauskova et al., 2013). With the intention of establishing global networks and achieving a competitive advantage, leaders are increasingly attracted to green supply chain management, with emphasizes placed on achieving cost reduction and economic growth (Huang, Tan, & Ding, 2012). Kumar et al. (2012) indicated that some companies engage

in green supply chain practices to increase profitability through waste reduction. Profitability increases with the removal of waste from the supply chain (Kumar et al., 2012). Nahmias (1982) identified seven areas of supply chain waste that are overproduction, unnecessary inventory, transportation, processes, activities related to the rejected product, waiting time, and unnecessary motion. Huang et al. (2012) noted that designing and redesigning a company's products and processes are crucial elements for creating a sustainable supply chain. Green sustainability increases efficiencies, improves customers' perception of the company and the products, attracts new supplies, and lowers costs (Kumar et al., 2012). Gimenez and Sierra (2013) emphasized that effective governance of the green supply chain requires managers up and down the supply chain to collaborate in a decentralized manner. As part of the governance process, supply chain managers use their resources to ensure waste reduction, improved delivery times, and increased consumer satisfaction (Mangla, Madaan, & Chan, 2013).

To implement green initiatives, supply chain managers use wireless sensor network technology to track products and maintain real-time visibility of products within the supply chain (Hafliason, Olafsdottir, Bogason, & Stefansson, 2012). Managing perishable inventories requires effective supply chain visibility. Maras (2014) indicated that organizations, such as Wal-Mart, Safeway, and Sunteck Inc., use wireless sensor network technology for managing the supply of perishable products. Temperature control and temperature visibility remains a key aspect of perishable food distribution. Maras (2014) noted that the use of wireless sensor network technology facilitates effective

management of temperature control within the supply chain for perishable products. Reducing spoilage with the use of technology proves beneficial in improving profitability as well as consumer satisfaction and loyalty (Maras, 2014). Fitting distribution centers, warehouse facilities, and distribution equipment with wireless sensor network technology is an effective green strategy to reduce cost and spoilage (Maras, 2014). Konieczny, Dobrucka, and Mroczek (2013) noted that when supply chain managers take on the role of *green agents*, waste reduction occurs, profits increase, and consumers remain satisfied and loyal to the company.

Summary and Transition

In Section 1, I introduced the subject of perishability in the retail grocery business, with a special focus on the strategies that supply chain managers use to minimize perishable food loss. The section began with background overview of the problem, problem statement, purpose statement, and a detailed review of the literature to support the study.

In Section 2, I further develop the plan of study on this research topic on strategies of supply chain managers in Western Pennsylvania. This section includes details of the role of researcher, description of both the participant population and selection methods, along with identifying and justifying both the study method and design. The study methodology, data collection, and analysis with a discussion of reliability and validity of the study are also included.

In Section 3, I present the findings of the study, compare the findings to the empirical research studies, and note whether the findings confirm or refute the findings of prior research. I provide several recommendations for business applications, the implications for social change, and recommendations for future research.

Section 2: The Project

This section includes how I used a qualitative case study design to explore how supply chain managers in the retail grocery business minimize perishable food loss. I define my role as a researcher and include a discussion of the chosen research method and design along with details to support and define the qualitative case study approach. I outline the population, align the strategy of the study to my objectives, and discuss the ethical practices of the study so that the research included the process and documentation for participant selection. In Section 2, data collection and review techniques support the decision to use face-to-face interviews as well as the strategies used to collect and analyze data. Section 2 includes a discussion of the method used to authenticate and validate the data collected in this study.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies that some supply chain managers in the retail grocery business use to minimize perishable food loss. The target population consisted of supply chain managers in six retail grocery businesses located in Western Pennsylvania because they have successfully implemented strategies to minimize perishable food loss. The findings of this study are expected to contribute to positive social change through the reduction of perishable food loss, increased food supply, lower retail prices to the consumer, improved customer satisfaction, and safer food offerings to the consumer. Consumer prices of perishable food reflect the losses incurred by the retail grocery business (Neff et al., 2015).

Ringsberg (2014) noted the health concerns related to the consumption of perishable food because of latent decay or contamination. Society might also benefit from this study because of safer, higher quality perishable food inventories.

Role of the Researcher

The role of the researcher requires well-established interviewing skills and techniques because the quality of the information gathered depends on the researcher's ability to collect appropriate data (Rubin & Rubin, 2012). According to Nakkeeran and Zodpey (2012), the researcher performs all interactions with the study participants. The researcher is the research instrument and data collector, she or he analyzes the data, and presents the results in an ethical and objective manner (Marshall & Rossman, 2016). In my role of researcher, I was the primary data collection instrument. I conducted all the interviews using developed interview skills and appropriate interview techniques. I performed all the interactions with the participants. These interactions included asking organizations to participate, communicating with selected organizations and participants, scheduling, and conducting the interviews and following up with participants. Anney (2014) noted that the pillar of qualitative research is trustworthiness. Thus, to enable trustworthiness, researchers use member checking as a process to improve the credibility of the research result. Marshall and Rossman (2016) noted that when researchers use member checking and include participants in the data interpretation process, they have a better opportunity to enhance the trustworthiness of their findings. I conducted member checking by meeting with the participants after the initial interview to present a summary

interpretation of the transcribed interviews for their validation of both accuracy and meaning.

My interest in this study directly related to my experiences as an employee and a manager in the retail perishable food industry. The aim was to obtain an in-depth understanding of the strategies and practices supply chain managers use to combat the challenges associated with minimizing perishable foods loss in the grocery retail business. I worked in the perishable retail industry as an employee and a manager for 20 years; I developed previous business relationships with peers in the industry. This experience provides background regarding how perishable grocery retail operates. The most significant ethical concern of a researcher is to abide by the rules designed to eliminate any unethical behaviors in accordance with high ethical standards (Hammersley, 2013). Maintaining an open and neutral approach throughout the interview process is essential to mitigating biases (Blythe, Wilkes, Jackson, & Halcomb, 2013). To mitigate any biases in this study, I disclosed any relationship that may affect the study's outcomes and ensure the interview process is transparent, open, and neutral. I objectively analyzed the data without any personal view or opinions. Yin (2018) noted that bias could redirect or change the direction of a case study. Yin indicated that a disclosure to all participants that inclusion in the study is voluntary and there is no special treatment awarded to any participants to participate in the study.

Ethics in research mandates that I protect the dignity and privacy of the participants. The Belmont report identified the basic principles of conduct when research

includes human subjects (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). The report's key guiding principles include respect for persons, especially those who are vulnerable, beneficence, or an obligation not to harm, avoid any deception, and to treat all participants equally (Bloomberg & Volpe, 2012). Kumar et al. (2013) maintained the identity of the participants kept protected and disclose any risk with the study. I obtained informed consent from the participants and I fully explained the study, solicitation, and participation as to how I protected their identity as well disclosed any risks associated with the study. The university's Institutional Review Board (IRB) is the regulatory body responsible for regulation and oversight of all research ethics (Bloomberg & Volpe, 2012). Walden University subscribes to this policy through the completion of student training, certification, and a formal request to IRB using the Short-Form Ethics Approval Application to IRB (Walden University, 2014).

I used an interview protocol (see Appendix B) to ensure consistency throughout the interview process as well as an examination of relevant documents on perishable foods deterioration. I requested copies of company documents such as schedules, charts, memos, perishable food loss reports, and internal records related to third-party logistics services from an authorized representative of the company. I obtained a research partner letter of cooperation from the authorized representative of each of the businesses to gain access to company documents. Yin (2018) emphasized the need for multiple sources of data within each case to provide the opportunity for a broader review of guidelines and

behavior. Interviews of successful supply chain managers associated with perishable deterioration and reducing wastage provide the basis for each case. Yin indicated that documentation and observation would add another layer of data to identification to the procedures and processes adopted.

Participants

Marshall and Rossman (2016), Robinson (2014), and Yin (2018) noted that participants must possess the knowledge and strategies necessary to provide enough data to answer the research questions. The goal is to choose six supply chain managers from the target population who meet the study criteria and represent the overall population. The target participants in this study will be supply chain managers in six Western Pennsylvania retail grocery businesses. I selected participants based on successful experiences and knowledge managing and implementing strategies used to minimize perishable food loss. The rationale for choosing participants is to obtain an in-depth understanding of the research (Cronin, 2014; Eno & Dammak, 2014; Yin, 2018). I used purposeful sampling to seek participants who have practical experiences and in-depth knowledge of dealing with perishable food and strategies undertaken to minimize perishable foods loss in the grocery retail business.

Englander (2012) noted that finding participants for qualitative research can be complicated, yet success improves through using established networks. The identification of participants started by my reliance on the grocery retail business network of the established relationships within the active Western Pennsylvania supply chain managers'

community. In my initial e-mail describing my study, I discussed the nature of the study, goals, the responsibilities, and the recruitment requirements of participants. After the organizational leaders provided a letter of cooperation, and after I received IRB approval from Walden University, I contacted the potential participants and to begin to establish an initial professional relationship via e-mails and telephone communications. I e-mailed potential participants an invitation to participate in the study. Contacting potential participants by e-mail is an appropriate way to gain access to suitable participants, provide an overview of the study, the process of interviews, expectations regarding the amount of time and effort involved with participation (Hyett, Kenny, & Dickson-Swift, 2014; Ketokivi & Choi, 2014).

Research Method and Design

Research Method

When a researcher focuses on the aspect of a what question, a qualitative method is a preferred approach and exploratory means for answering the research question (Yin, 2018). Qualitative researchers focus on building a holistic understanding of phenomenon from a multitude of perspectives (Verdinelli, 2013). Qualitative researchers seek to discover the deeper meaning of a phenomenon through open dialog with participants (Kahlke, 2014). I selected the qualitative method to discover deeper insight into the strategies supply chain managers use to minimize perishable food loss through open dialog with participants. The strengths of a qualitative approach reflect in its in-depth and

written descriptive nature that provides enough details for the reader to discover the meaning and understanding of the phenomenon (Ketokivi & Choi, 2014; Singh, 2014).

In a qualitative study, no set measurement or predetermined hypothesis exists, and questions evolve cumulatively as the inquiry continuous (Cronin, 2014; Yin, 2018).

Conversely, researchers conducting a quantitative method study rely on numeric data for statistically testing hypotheses among variables (Cronin, 2014). Quantitative questions are rigid and do not allow for participants' perception or commitment, which could further the understanding and application of the profession (Stone & Miller, 2012). Singh (2014) and Yin (2018) noted that researchers prefer the qualitative method instead of the quantitative or mixed method to explore concepts such as awareness, insights, experience, knowledge, and strategy implementation. The quantitative research method is not appropriate for this study because I am not collecting numeric data, conducting statistical analysis, or seeking to determine the significance of relationship among variables.

A mixed-methods approach is an option of integrating qualitative explorative techniques and a quantitative analytical technique combined with data triangulation can result in an effective strategy (Fetter, Curry, & Creswell, 2013; Yin, 2018). Mixed-method researchers include both a qualitative element and quantitative element (Kahlke, 2014). Because I am not testing statistically analyzing numeric data nor testing hypotheses regarding relationships between variables, a mixed-methods approach is not appropriate. Because methods such as quantitative or mixed methods remain dependent

on the strength of variables, these methods are unfeasible for the current study. The qualitative research method is the most appropriate method for this study.

Research Design

In choosing a specific design, the researcher should consider the advantages and disadvantages, the information availability, objectives, and costs associated with the study whether selecting a phenomenology, ethnography, narrative inquiry, or case study design (Tsang, 2013; Vohra, 2014; Yin, 2018). The research design for the study is a qualitative multiple case study. Singh (2014), Vohra (2014), Yin (2018) noted that case study researchers explore a specific boundary of interest by adopting a multiple data system collection method to pinpoint themes. A multiple method depicts perspective of organizational operations from the diverse applicable viewpoint (Yin, 2018). In the qualitative multiple case study, I combined exploratory and descriptive research to answer the research question.

Yin (2018) indicated the appropriateness of case study design for exploring a phenomenon within a bounded, contextual setting. I used the case study design because I sought to explore a phenomenon within a bounded, real-world setting. Using a multiple case study may result in a more compelling and overall robust study than a review of a single case (Yin, 2018). Researchers use a qualitative multiple case study approach to gather richer data through the diversity of knowledge and insight of participants from different organizations (Yazan, 2015; Yin, 2018). My goal was to gain an understanding of the participants' viewpoints on the strategies used to minimize perishable food loss.

Yin (2018) noted that case studies might be exploratory, descriptive, explanatory or combination of two or more processes. Harnessing a multiple case study design will provide the multilevel collection of data. Researchers using face-to-face, semistructured interviews with open-ended interview questions identify comparative impressions and insights within each of the respective organizations (Cairney & St Denny, 2015). In a qualitative case study, researchers accord special scrutiny to completeness in observation, reconstruction, and analysis of the case under study (Hyett et al., 2014). De Massis and Kotlar (2014) argued that case study functions better when the goal is to gain an in-depth knowledge and admiration of the issues.

Qualitative case study research offers the likelihood to study and define the situation in more detail than using other types of approach (Eno & Dammak, 2014). A disadvantage of qualitative multiple case study design is the inability statistically to generalize the findings, especially where there is reliance on the research developing themes to gather data (Yin, 2018). The researcher extracts what the person considers relevant, perspective, and descriptions of the phenomenon, thus clustering the view statements into themes (Yin, 2018).

Yin (2018) also noted that case studies are more appropriate than phenomenological design when dealing with one or more organizational populations. Eno and Dammak (2014) stated that a phenomenological design is useful for obtaining individuals' perceptions about phenomena. I did not use the phenomenology design

because the researcher using phenomenological research focuses on individuals rather than examining the organizational implications of the data and conclusion.

Ethnographic researchers seek to understand the in-depth knowledge of the participant, societies, or cultures (Yin, 2018). Researchers using an ethnographic design provide empirical data by describing the shared behaviors, values, or beliefs of a culture or group ((Eno & Dammak, 2014; Thomas & Magilvy, 2011; Yin, 2018). I did not use the ethnographic design because I did not seek to understand the culture of the retail grocery business.

A qualitative researcher attains data saturation when information from data collection produces the same or no change to the data (Yin, 2018). Fusch and Ness (2015) stated that data saturation occurs when new data no longer provides the researcher the ability to code new data or identify new themes. When the data collected no longer offers any new insight, data saturation occurs, but the sample or number of participants does not determine data saturation (Houghton, Casey, Shaw, & Murphy, 2013). Saturation is the goal to produce enough support that further research would be meaningless to the study (O'Reilly & Parker, 2012). Yin (2018) noted that researchers achieve data saturation through multiple interviews, observations, and the examination of relevant documents. I engaged in multiple interviews, member checking, and examination of relevant company documents to ensure data saturation. I continued these activities until no new data, no new themes, and no new coding emerged.

Population and Sampling

The population group targeted for this study was supply chain managers from six retail grocery businesses within the Western Pennsylvania region of the United States. The population subset chosen was a purposeful sampling of supply chain managers who implemented strategies to minimize perishable food loss. I selected participants using a purposeful sample method. Cleary, Horsfall, and Hayter (2014), Hyett et al. (2014), and Pezalla, Pettigrew, and Miller-Day (2012) noted that the appropriate population and sampling method-built trust and networking with organization stakeholders in understanding qualitative inquiries. Pezalla et al. defined the term *population* in an inquiry as an extensive collection of items used for quantitative, qualitative, and mixed-method exploration. Yin (2018) warned that the terms *purposeful* and *sampling* might be misleading where the lack of randomized selection may reflect intentional bias. Burmeister and Aitken (2012) further explained that purposeful population sampling means that the researcher purposefully selects people with the experience necessary knowledge for providing relevant information specific to gain an in-depth understanding of the research question. With the permission of the management of the organizations, I approached the supply chain managers who meet the eligibility criteria for participation. I determined the eligibility of participants based on their current employment position as a supply chain manager or a manager with supply chain oversight who has implemented strategies to minimize perishable food loss. Participants are supply chain managers from six retail grocery businesses within Western Pennsylvania who performed transactions or

provided supply chain oversight responsibilities in the minimizing of perishable food waste. Participants conducted face-to-face interviews at their place of business or a mutually agreed upon location, the public library.

Burmeister and Aitken (2012) noted that a small sample size of participants is appropriate when using a qualitative inquiry. Pezalla et al. (2012) cautioned against using or taking a large sample size in qualitative inquiry. Pezalla et al. noted that some qualitative experts argue that larger sample size is reliable, but larger samples sizes are prone to a more significant number of errors with measurements, sampling, comparison, and aggregation. Yin (2018) explained set sample sizes in qualitative research are seldom evidence-based.

Pezalla et al. (2012) stated that qualitative case study samples size should be one to eight participants, preferably five. The target population for this study consisted of six supply chain managers from six retail stores. An appropriate sample is participants who clearly represent and have insights on the research subject (Robinson, 2014). Malterud (2012) noted that the sample population selected should be sufficiently large and varied to achieve the study intentions. He further elucidated that large sample size can add depth to the study but that the aim of the sample size should be to provide the whole of the story, not just to define a set number (Malterud, 2012). Yin (2018) did not provide an exact number of cases within multiple case studies; instead, noted that the number of participants (or cases) is dependent upon the discretion of the researcher.

In a review for the National Center for Research Methods in Great Britain, Baker and Edwards (2012) identified and consulted with 14 experts on sample size. Baker and Edwards concluded that sample size depends on issues such as resources available to the researcher, time available, what a dissertation committee requires, the level of data quality desired to develop the study, and the nature of the study. Englander (2012) deemed sample size irrelevant within qualitative research yet noted the need for an ample sample to collect rich data. Cleary et al. (2014) noted that a large sample size too might result in repetitive information while an inadequate sample size might not provide enough data for the researcher to form any consensus or triangulation in results. Opata (2015) conducted qualitative case study research within supply chain firms, using a sample size of 11 participants. Williams (2015) conducted a multiple case study of retail distribution collecting interview data from six small businesses owners. Paul (2017) studied the phenomenon of harm crises within the food industry, using three participants as the sample size. Because my study was similar to the research conducted by Opta, Williams, and Paul, six participants was an appropriate sample size.

Interviewing participants is the most critical method of data collection in a qualitative case study (Wang, 2015; Yin, 2018). Selecting the proper interview setting is a necessary step in the research planning process because the selection of the site may have an influence on the mood of the participants and influence how the participants respond to the open-ended questions (Check, Wolf, Dame, & Beskow, 2014; Cleary et al., 2014; Wang, 2015). A private meeting room in a public library can be an excellent

place to conduct face-to-face interviews (Check et al., 2014). Therefore, I chose a private meeting room in a public library close to the business locations to conduct the interview. Researchers should audio record the interviews for transcription and analysis purposes (Stuckey, 2014). I recorded each interview using an audio digital recorder with an iPhone 8 as a backup. I took reflective notes during the interviews to document any nonverbal cues, observations, or hesitations in participants' responses.

Although researchers seek data saturation in qualitative research to ensure the trustworthiness of the data, no direct correlation exists between the sample size and reaching data saturation (Yin, 2018). Data saturation in qualitative research is a way to ensure one obtains valid, dependable, credible data. Using too small of a sample or too large of a sample will not ensure data saturation (Burmeister & Aitken, 2012). Fusch and Ness (2015) noted that researchers using small samples should engage in member checking to help reach data saturation. Saturation is the goal to produce enough support that further research would be meaningless to the study (O'Reilly & Parker, 2012). Yin (2018) noted that researchers achieve data saturation with multiple interviews, observations, and the examination of relevant documents. I engaged in multiple interviews, member checking, and examination of relevant company documents to ensure data saturation. I continued these activities until no new data, no new themes, and no new coding emerge.

Ethical Research

Based on the criteria established, I identified potential participants for the study, relying on my long-time relationship with the supply chain community. I obtained permission from Walden University's IRB to collect and analyze data. The Walden University IRB approval number for this study was 06-29-18-0458334. The role of the IRB is to ensure that research proposal meets the acceptability criteria of applicable law on professional practices and conduct standards (Check et al., 2014). I explained the purpose of the study and potential benefits of participating. I contacted potential participants first via e-mail, providing a detailed description of the study. I confirmed my role as researcher, review the commitment of the participant for study, and ensure the confidentiality of the participant.

I informed participants of their right to withdraw from the study. I provided my contact information and follow-up with the contacted supply chain manager to ascertain their desire to participate. Participants could withdraw via e-mail, in person, by telephone contact before, during, or after the interview. Participants received no incentives or compensation for participation; however, I provided each participant a pdf copy of the published study. Researchers should avoid incentivizing participants for social science research studies because the use of incentives might compromise the key ethical principle of participation in research that is of free, informed consent (Hammersley, 2014).

Upon securing verbal or e-mail agreement, I provided each participant with an informed consent form and obtain their informed consent prior to beginning the

interviews. The informed consent form further documents the background information and purpose of the study, the procedures for consent, and recapitulates the voluntary nature of the study including risks, benefits, and compensation. I offered to meet with the organizational leaders to discuss the results further. The consent form included assurance of privacy throughout the study as well as the security and retention of data. Finally, the consent form details the participants' right to withdraw from the study. Acceptance of their consent to participate in the study was by signing and dating the consent form. I coded participants P1, P2, P3, P4, P5, and P6 to remove all personal identifiers from within the study. I will retain consent forms, along with all recordings and documentation for a period of 5 years in a locked safe in my home office. After 5 years, destruction of all records occurs.

Data Collection Instruments

Researchers use a variety of data collection instruments such as questionnaires, aptitude tests, surveys, personality tests, existing documents and records, and interviews (Yazan, 2015). The objective of using the semistructured interview process is to create an open dialog between the researcher and the participants (Pezalla et al., 2012). The interview process is a social interaction with the aim of the researcher to produce a series of consistent and credible findings (Pezalla et al., 2012). The interview process facilitates the creation of a relationship between the researcher and the participants for inquiry, exploration, and open discourse (Fielding, Fielding, & Hughes, 2013). I, as the primary data collection instrument, used semistructured interviews with open-ended questions to

collect primary data, create a rapport with participants, and build a positive working relationship to produce dependable, credible finding.

According to Pezalla et al. (2012), the building of trust and facilitation of dialogue occurs with the suitable use of energy, neutrality, and self-disclosure. Following the recommendation of Grant, Rohr, and Grant (2012), I avoided complex, *yes* or *no*, or leading questions (see Appendix A). Grant et al. recommended the use of single questions, preceding with an overview of the topic and appropriate preliminary statements. I provided clarification statements if participants request additional information regarding a question or when participants appear to falter in recalling past events or processes. I was cognizant of these likelihoods and made appropriate adjustments in the interview process to appreciate the context of the interview and sensitivity of the topic.

In qualitative interviewing, the process of shared discovery is adaptive, energizing, and organic (Rubin & Rubin, 2012). The goal of the interviewer is to explore and understand the phenomenon under study from the participants' perspective (Onwuegbuzie & Byers, 2014). Researchers generate useful information asking participants questions about their knowledge and experience regarding the phenomenon (Alby & Fatigante, 2014). Cornell, Johnson, and Schwartz (2013) noted that researchers should develop interview questions in direct alignment with the central research question. I developed open-ended interview questions aligned to the research question (see Appendix A). Rowley (2012) noted that standardized semistructured interviews include

initial identical sets of open-ended questions for each respondent, yet the researcher should ask to follow up questions in the event of the need for additional clarity of an interviewee's response. Rowley also outlined several principles for preparing for interviews including (a) providing informed consent and confidentiality, (b) selecting an interview setting with minor distractions, (c) advising participants of the time required and format, (d) providing participants with follow-up contact information, and (e) use of recording devices. Rowley recommended the use of an interview protocol to ensure consistency in the interview process. I used an interview protocol to maintain consistency before, during, and after the interviews (see Appendix B).

Onwuegbuzie and Byers (2014) noted that using varying instruments in a face-to-face interview in qualitative studies enhances the data collection. Onwuegbuzie and Byers noted that audio recording of the interviews is essential to capturing the exact responses from participants. I used the digital recording feature on an iPhone 8 to record the interviews, allowing me time to focus more on the substance of the response versus concentrating on note-taking. Observation of participants during the interview provided visual nuances not captured by an audio recording; such cues may indicate the need for follow up questions to gather all the information available from the participant (Onwuegbuzie & Byers, 2014). In addition to recording the interviews, I took notes regarding any interruptions, nonverbal communication observed, or hesitations in the participants' responses that might indicate the need to ask a follow up question for clarity.

Yin (2018) noted to use methodological triangulation; researchers must collect data from multiple sources. In addition to collecting data using semistructured interviews, I reviewed company documents, memos, and archived records on perishable food loss. Furthermore, I reviewed relevant academic journals, published books, and websites for additional information on perishable food loss in the retail setting. I obtained access to the company documents and records through the business owner or authorized official signing a letter of cooperation. To ensure the confidentiality of the participants, I avoided using any personal and company identifiers through coding the participants as P1, P2, P3, P4, P5, and P6. I will retain consent forms, along with all recordings and documentation for a period of 5 years in a locked safe in my home office. After 5 years, destruction of all records occurs through shredding of paper documents and deletion of electronic documents.

Researchers use member checking to enhance reflexivity, ensure researcher bias does not interfere with data interpretation, and allow the participants to verify the accuracy of the interpretation of the interview data (Thomas & Magilvy, 2011). Member checking is a process used by researchers to ensure dependable and credible data as well as enhance the richness of a data (Fusch & Ness, 2015). To ensure dependable and credible data, I transcribed the interviews, analyzed the responses, created an interpreted summary of the transcripts, and met once again with the participants to allow them to verify the accuracy and completeness of the interpreted summary. In addition to

validating the interpreted summary, I sought additional information from the participants to facilitate data saturation.

Data Collection Technique

Researchers use face-to-face interviews and document reviews to gain a deeper understanding of a phenomenon using multiple data collection techniques (Rubin & Rubin, 2012; Yin, 2018). I conducted face-to-face, semistructured interviews with the participants who implemented strategies and practices to minimize perishable food loss. I followed a strict interview protocol to ensure consistency through the interview process (see Appendix B). The interview setting is the private meeting room in a local public library, yet I accommodated the participants' if the need exists to meet in another neutral location. By providing a neutral setting, participants can be in an environment more opportune to open conversations. Each participant will have a unique identification number; therefore, ensuring nondisclosure of personal information including the participant's name and organization. I recorded each interview using an audio digital recorder with an iPhone 8 as a backup. Yin (2018) noted that in a qualitative case study, collecting data follows a formal protocol of which the specific information that may become pertinent to a case study is not readily foreseeable. The stream of questions in a case study interview is likely to be fluid rather than unyielding (Rubin & Rubin, 2012). I followed the recommendations of Rubin and Rubin (2012) and continued to probe the participants as to why events of facts materialize as they do.

I gained access to the companies' supply chain managers through the authorized representative of each company signing a research partner letter of cooperation.

Following an interview protocol (see Appendix B), I began the semistructured interviews with a greeting, an introduction of the topic of the interview, and an explanation of the informed consent form to include that participation is voluntary, their right to withdraw at any time, and that no offer of compensation for participation exists. I ensured that the participants provide informed consent prior to beginning the formal interview. I informed the participants that audio recording of the interview occurs for transcription purposes. I asked each participant the same interview questions (see Appendix A), take notes to document observations, the participants' nonverbal communications, or any abnormalities, and ask to follow up questions to gain additional clarity if needed. After the interview, I scheduled a follow up meeting with each participant, provide each with a summary of the interview transcripts, and ask for their validation of the interpretation as well as seek additional information.

I informed each participant that I will request copies of company documents such as schedules, charts, memos, perishable food loss reports, and internal records related to third-party logistics services from an authorized representative of the company. These company documents are the second source of data for this study. I obtained a signed research partner letter of cooperation from the authorized representatives of the companies to access company data. To use methodological triangulation with a qualitative study, researchers collect data from multiple sources (Yin, 2018). In addition

to company documents, I reviewed academic studies published after the onset of this study, relevant websites, media reports, and published books pertaining to the perishable food industry. I analyzed all the data and information gained a better understanding of and validate the strategies and practices that successful supply chain managers use to minimize perishable food loss.

Researchers should transcript the interviewee's responses and complete an interpretation of the responses as soon after the interview as possible (Lauckner, Paterson, & Krupa, 2012). Transcription of the participants' responses begins within 24 hours after each interview to conduct the interpretation while information is new as well as to engage the participants in member checking before the loss of recall occurs. Researchers should securely store all research records and remove all personal identifiers from the published study (Lauckner et al., 2012; Nakkeeran & Zodpey, 2012). I coded participants P1, P2, P3, P4, P5, and P6 to remove all personal identifiers from within the study. I stored written copies of transcripts, notes, informed consent forms, and company documentation in a locked safe in my home office and stored electronic data on a password protected external hard drive. I will retain all research records for 5 years and then destroy following IRB guidelines.

The advantages of using semistructured interviews as a data collection technique include the researcher's ability to conduct the interviews using open-ended questions, creating a rapport with participants, and the opportunity to record the interview responses to ensure accuracy (Yin, 2018). Researchers use semistructured face-to-face interviews

for rapid data collection process while conducting an in-depth exploration of a problem (Cleary et al., 2014). When the researchers adhere to a strict interview protocol, each participant responds to the same questions and undergo the same process; therefore, credibility of the data increases (Wang, 2015; Yin, 2018). Researchers using semistructured interviews can use probing questions to clarify participants' responses while monitoring the participants' verbal reactions. An additional advantage is that the researcher can quickly process the data to obtain feedback from participants within a short time frame.

The disadvantages of using semistructured interviews include researcher bias, the quality of data collected, and the time and cost associated with performing multiple interviews (Yin, 2018). Wang (2015) noted that ethical situations potentially arise in face-to-face interviews in which the participants refuse to respond or offer a less than complete and truthful answer. Another disadvantage is when the researcher confronts complex issues arising from researching sensitive topics, the participants might not respond fully, completely, or accurately (Cleary et al., 2014).

The organizational decision makers might oppose the data-sharing request for company documents because of proprietary or corporate standard of business conduct policies (Xue et al., 2013). I obtained a research partner letter of cooperation from the authorized representative of each of the businesses prior to requesting company documents. Another disadvantage of document review is that company records might be inaccurate or incomplete. Yin (2018) noted that reviewing documentation is a viable

means to collect secondary data to validate primary data. Researchers conducting qualitative case study research need at least two sources of data to use methodological triangulation to analyze data; document review is an acceptable method to collect secondary data (Hartman, 2013).

I reviewed options for member checking with participants during the opening interviews to alleviate concerns about expectations and time commitments. Harvey (2015) and Nakkeeran and Zodpey (2012) noted that the researcher should review the requirements of member checking with participants, explain the process, and describe the purpose of the follow-up meeting. Harvey stated that researchers involve participants in member checking to edit and confirm the accuracy of the transcribed summary of the interview. Member checking is a process researchers use to allow the participants the chance to make corrections to the summary of the transcribed interviews and approve the accuracy of my interpretation of their responses. Member checking, as noted by Harvey (2015), is a process to allow the participants to have voice and engagement within the research process. I used member checking to allow participants the opportunity to review a summary of their responses and respond to my initial interpretations.

Data Organization Technique

Yin (2018) commented that data organizational techniques begin with the understanding of data instrument administration that included notes, assigned generic codes for participants, audio recordings, and journals. The assigned generic codes hide the participants' identities and protect their confidentiality (Chen et al., 2013; Lawrence

& Tar, 2013; Yin, 2018). Houghton et al. (2013) noted that researchers should begin data organization by applying codes to participants' names and data collected from each participant to ensure confidentiality. To begin data organization, I coded participants P1, P2, P3, P4, P5, and P6 to remove all personal identifiers from within the study. I organized the data using computer software such as Microsoft Word and Excel, and NVivo12. Researchers use NVivo qualitative analysis software application to organize large volumes of data such as interview transcripts to analyze for identification of patterns and themes (Anney, 2014; Bloomberg & Volpe, 2012; Lawrence & Tar, 2013). I organized the interview transcripts, the member-checked summary of the transcripts, and data drawn from company documents into labeled files and folders in Microsoft Word and Excel. I organized the data by case, then compared and analyzed the data to identify emergent themes and patterns. Yin noted that researchers use computer software to store and organize data in a systematic manner using labeled files and folders for easy retrieval. I used NVivo12 software to organize, disassemble, and reassemble the data. Many researchers found NVivo12 software to be more user friendly and more applicable to qualitative data analysis than Atlas.ti or MAXQDA software (Harvey, 2015; Yazan, 2015; Yin, 2018).

Proper and safe storage of all research documents, files, records, and notes is a paramount process that researchers must undertake to ensure adherence to the participants' right of privacy and maintain high ethical standards (Lauckner et al., 2012; Nakkeeran & Zodepy, 2012). I stored written copies of transcripts, notes, informed

consent forms, and company documentation in a locked safe in my home office and store electronic data on a password protected external hard drive. I will retain all research records for 5 years and then destroy after the 5-year period. Destruction of the research records occurs through shredding of paper documents and deletion of electronic files.

Data Analysis

Data analysis encompasses an audit trail of all recordings, notes, transcripts, reflexivity by the researcher, and thick and rich descriptions across each case study (Reybold, Lammert, & Stribling, 2013; Singh, 2014; Verdinelli, 2013). I provided an audit trail of all the documents. Methodological triangulation in qualitative research is beneficial in confirming findings with the added benefit invalidity and the understanding of the phenomenon (Hartman, 2013). Houghton et al. (2013) defined qualitative data analysis as a means of triangulating and rigorous process in a case study. I used methodological triangulation as the data analysis technique. Yin (2018) noted five phases of data analysis, which are (a) compiling, (b) disassembling, (c) reassembling, (d) interpreting, and (e) concluding data.

Compiling the Data

Reybold et al. (2013) and Yin (2018) noted that to engage in data analysis and data management, the researcher must first compile the data in an organized and logical manner. Verdinelli (2013) noted that data organization and coding are essential steps in the data compilation phase. I compiled the data through organizing the interview transcripts, the member-checked summary of the transcripts, and data drawn from

company documents into labeled files and folders in Microsoft Word and Excel. I then compiled the organized data through uploading to NVivo12 qualitative analysis software program to begin the computer assisted disassemble phase.

Disassembling the Data

Researchers conducting a qualitative study should disassemble the data into organized fragments through coding (Bailey, 2014; Verdinelli, 2013; Yin, 2018). Coding data includes labeling, describing, categorizing, and grouping of the compiled data into related fragments (Bailey, 2014). NVivo12 software is a tool used by researchers for disassembling data into fragments, specific words and phrases, and primary and subordinate groups (Bloomberg & Volpe, 2012; Yin, 2018). I disassembled the data through coding to include labeling, describing, and categorizing data into fragments using NVivo12. Stuckey (2014) noted that data disassemble requires coding that aligns with the research question. I coded the data in the disassemble phase in alignment with the research question to begin the reassemble phase.

Reassembling the Data

The reassemble phase of data analysis is a process of clustering, categorizing, labeling, and sequencing data into groups representing patterns and themes (Grant et al., 2012; Yin, 2018). Lauckner et al. (2012) noted that researchers reassemble data through pattern and theme coding that aligns with the central research question. I used NVivo12 in the data reassemble phase to cluster, group, categorize, and label the emergent patterns

and themes. I remained focused on theme and pattern identification that is in alignment with the overarching research question for this study.

Interpreting the Data

In the interpreting data phase, researchers create thematic narratives from the reassembled data (Lauckner et al., 2012; Yin, 2018). The researcher should interpret data through the lens of theoretical or conceptual framework to align the interpretation with the primary objective of conducting the research study (Tsang, 2013). When using a qualitative multiple case study design, the researcher interprets a diverse set of data, which improves the dependability, and credibility of the findings (Almutairi, Gardner, & McCarthy, 2014). I used themes and patterns found using NVivo12 to create thematic narratives that remain in alignment with the research question. I interpreted the data through the lens of the perishable inventory theory originated by Nahmias (1982).

Concluding Data Analysis

To conclude data analysis, researchers apply final analysis to the collected, coded, extracted, and interpreted data to arrive at the key themes required to answer the research question (Kapoulas & Mitic, 2012; Yin, 2018). The data-concluding phase includes examining key themes drawn from the interview data in comparison to data from other sources to engage in methodological triangulation (Yin, 2018). Hartman (2013) noted that researchers using qualitative data must mitigate personal biases during the concluding phase to ensure dependable and credible findings. I concluded data analysis through methodological triangulation of the key themes drawn from the interview data

with the documentation data drawn from company records. I accepted and presented all data regardless of my personal viewpoint or experiences with the phenomenon. I compared the findings of this study to similar past and current studies on perishable food loss.

Software Plan

Many researchers prefer to use NVivo12 software instead of Atlas.ti or MAXQDA software because NVivo12 is more user-friendly and more applicable to qualitative data analysis (Harvey, 2015; Yazan, 2015; Yin, 2018). I used NVivo12 software to disassemble and reassemble the data because of the user-friendly features and applicability of qualitative data analysis. Yin (2018) noted that software as an application for documentation to foster systematic folder organization. Anney (2014) noted that researchers use the NVivo software application to categorize large volumes of data to minimize errors and perform data coding and new emerging themes. Researchers preferred NVivo12 software application for qualitative data analysis because of the online and offline usability (Anney, 2014). Yin (2018) noted that the use of technology tools and computer software, such as a voice recognition audio recorder and qualitative data analysis software programs, is a means for the researcher to produce unbiased interpretations.

Key Themes

Researchers discuss and document the themes interpreted in the interpretation and reassembling phase (Harvey, 2015; Yazan, 2015; Yin, 2018). Houghton et al. (2013)

noted that qualitative researchers use coding to reduce bias and support the credibility of the research finding. The themes and patterns found in analyzed data must align with the research question for the researcher to present credible findings (Bailey, 2014; Stuckey, 2014). I determined the most frequent and significantly relevant themes that emerge from the data and present the key themes resulting from the interpretation and reassembling phase of data analysis in the findings section of the study, including analysis of how the finding related to improved business practices and social change. I noted in the findings how the key themes confirmed previously published studies on the topic of perishable foods.

Reliability and Validity

Aravamudhan and Krishnaveni (2015) argued that reliability and validity in qualitative research relate to trustworthiness, quality, and rigor. Noble and Smith (2015) contended that the quality of research remains dependent on the creativity, skills, and flexibility of the researcher, yet without dependable and credible data, an insufficiency exists in the findings. Lincoln and Guba (1985), in their model of qualitative research rigor, noted four primaries of components of trust: (a) credibility, (b) transferability, (c) dependability, and (d) confirmability. Yin (2018) noted that researchers conducting a qualitative case study should place emphasis on dependability, and credibility, confirmability, and transferability instead of reliability and validity.

Dependability

Dependability is the consistent and steady processes used by the researcher during a qualitative case study (Anney, 2014; Aravamudhan & Krishnaveni, 2015; Yin, 2018). Data consistency and stability over time characterizes dependability (Tiira & Lohi, 2014). Tiira and Lohi (2014) noted that researchers strive for dependability to ensure a consistent, replicable, and dependable outcome. Aravamudhan and Krishnaveni (2015) incorporated the concept of meaningful adherence to strict research protocols to achieve dependability. Aravamudhan and Krishnaveni noted that researchers should meet four criteria (a) achieve the stated purpose; (b) use methods and representation practices that partner well with espoused theories and paradigms; (c) interconnect the literature reviewed with research foci, methods, and findings; and (d) accomplish the intent of the study. Houghton et al. (2013) noted the need for consistent data collection procedures and documentation of the research steps. I followed a consistent data collection process, use an interview protocol (see Appendix B), and maintain meticulous documentation of the research steps to facilitate dependability of the data and the findings of this study.

I engaged the participants in member checking to help ensure dependability of the interview data and to help ensure attaining data saturation. Member checking occurs by the researcher transcribing the interviews, analyzing the transcripts, summarizing the participants' responses, creating an interpreted summary of the transcripts, and meeting the participants again to allow them to review and validate the accuracy of the summary (Marshall & Rossman, 2016). I followed the recommendation of Marshall and Rossman

(2016) to allow participants the opportunity to review an interpreted summary of the transcribed interviews and validate the accuracy of the summary. Researchers improve the dependability of the interview data using reliable procedures such as member checking (Anney, 2014). When a researcher achieves dependability, the ability of future researchers to replicate the study improves (Nakkeeran & Zodpey, 2012). With consistent and proven processes, researchers achieve dependability of the data and the findings (Thomas & Magilvy, 2011).

Credibility

Researchers help confirm the credibility of the data as well as the findings through ensuring the participants' perspective is the basis of the interpreted data and findings, not the researcher's worldview, biases, or opinion (Anney, 2014; Bloomberg & Volpe, 2012; Yin, 2018). The goal of the researcher is to convey an in-depth understanding of the phenomenon under study from the participants' point of view (Anney, 2014). Researchers ensure credibility through the collection of rich data, the use of precise and detailed documentation, methodological triangulation, and member checking (Anney, 2014; Gorissen, van Bruggen, & Jochems, 2013; Nakkeeran & Zodpey, 2012). Researchers enhance credibility when using objectivity during data analysis as opposed to employing subjectivity (Bloomberg & Volpe, 2012). I ensured credibility by using the participants' knowledge and experience as the basis for data analysis and interpretation, avoidance of including my personal worldview, triangulating interview data with archived data, and member checking. The credibility of the data increases when

participants review the researcher's interpretation during member checking sessions (Yin, 2018). I maintained meticulous research notes to record each process and procedure undertaken during the study.

Confirmability

Confirmability includes the reflection by the researcher on the study, insights, noting bias, and feelings about each interview (Lawrence & Tar, 2013; Nakkeeran & Zodepy, 2012; Yin, 2018). I developed trustworthiness and confirmability in the findings of this study through asking probing questions during the interviews, engaging participants in member checking, triangulating interview data with data drawn from relevant company documents, and attaining data saturation. Anney (2014) noted that when researchers validate their findings, they stress trustworthiness, credibility, and accuracy of the data analysis and interpretation. I analyzed and interpreted the data without inserting my opinion or worldview, accepted all the data regardless of agreement, and presented accurate finding in order that confirmability by future researchers exists.

Transferability

As identified by Nakkeeran and Zodepy (2012), the transfer of finding to other contexts or groups is like the concept of external validity within quantitative studies, yet qualitative case study findings hold no degree of generalization to a larger population. By providing an in-depth description of the sample, study boundaries, and the research process, other researchers may determine that the data and finding are a good fit for other organizations or case settings (Lincoln & Guba, 1985). Future researchers determine the

transferability of the findings to other cases (Yin, 2018). I meticulously documented each research process, strive for dependable data, and ensure credible findings to enhance transferability of the findings by future researchers. I enhanced transferability through the articulation of a clear purpose, defining the selection of participants, outlining the data collection processes, and accurately interpreting the data.

Data Saturation

Determining an acceptable level of data saturation is crucial in qualitative research (Baker & Edwards, 2012). Baker and Edwards (2012) noted that researchers attain data saturation through a combination of research steps including the selection of an ideal sample population, the use of reliable data collection techniques, and collecting data from multiple sources to facilitate methodological triangulation. Data saturation occurred when no new themes or codes are relevant when considering the dependability and credibility of the data (Fusch & Ness, 2015). I achieved data saturation using multiple interviews with participants who met the eligibility requirement of this study following an interview protocol (see Appendix B), engaging participants in member checking to ensure I captured the essence of their responses, and reviewing relevant company documents. Member checking is the process of participants reviewing an interpreted summary of their interview responses to ensure the researcher's interpretation is complete and accurate (Marshall & Rossman, 2016). During member checking sessions, I sought information from the participants until I exhausted their ability to provide additional data.

Summary and Transition

The purpose of Section 2 was to provide the specifics of the study. Objectives identified include the role of the researcher and identifying participant criteria. I described and defended the research method and design along with data collecting and analyzing the data. I provided expert opinions on sampling, saturation, data collection, and data analysis.

In Section 3, I present the findings of my research, how the results of the study were appropriate for developing or improving strategies to minimize perishable food loss, and the implications for social change. I close Section 3 with a concluding statement.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative multiple case study was to explore the strategies that some supply chain managers in the retail grocery business used to minimize perishable food loss. The data for this study emanated from in-depth, semistructured interviews of six supply chain managers from six different retail grocery stores in Western Pennsylvania and a review of company documents. Each interview began with the participant's name, background, and the experience of the manager regarding implementing strategies to minimize perishable food loss. The preliminary questions were to ensure that participants qualified to participate in the study. The code names for the participants in this study are P1, P2, P3, P4, P5, and P6.

I asked each participant seven interview questions (see Appendix A). I engaged in member checking, attained data saturation, and used company documents for methodological triangulation. The analysis of data collected from the participants' responses detailed strategies they used to minimize perishable food loss in the retail grocery business. Three key themes emerged from the data: (a) inventory strategy, (b) logistics strategy, and (c) IT strategy. The participants used the three key strategies to minimize perishable food loss: daily deliveries, product rotation, the inventory process of first-in, first-out (FIFO), and proper ordering of products to meet customers' needs and market expectation.

Presentation of the Findings

The guiding research question for the study was as follows: What strategies do supply chain managers in the retail grocery business use to minimize perishable food loss? After receiving IRB approval, I recruited and interviewed six managers from six retail grocery business operating in Western Pennsylvania. In this subsection, I discuss the participants' responses, the data analysis, emerging themes, and conclusions that I used to answer the research question. The research consisted of multiple procedures with the interview of six participants, member checking, and reviewing relevant company documents. I used the thematic analysis technique during data analysis to identify patterns and themes. Researchers should use a data-driven approach during data analysis (Anney, 2014; Bloomberg & Volpe, 2012; Yin, 2018). I used a data-driven approach during the interpretation phase to explore the strategies supply chain managers in the retail grocery business used to minimize perishable food loss.

During the data analysis steps, I familiarized myself with the data. I transcribed the interview recordings into Microsoft Word format. I used NVivo software for coding and sorting the different codes into potential themes. At the final analysis and write-up of the report, I provided evidence of each theme using examples from the data.

The analysis of the research, interview questions, and documents produced three themes from the participants' responses: (a) inventory strategy, (b) logistics strategy, and (c) IT strategy. The participants shared their experiences and strategies to minimize perishable food loss in the retail grocery business. In all, participants indicated a higher

need for using multiple daily deliveries, product rotation, and maintaining product levels as keys to minimizing food loss.

Theme 1: Inventory Strategy

An inventory strategy to minimize perishable loss was a theme that emerged more frequently from the participants' responses than all other themes. Table 1 displays the key tactics the supply chain managers used to implement their inventory strategy. The participants used the key tactics to develop their inventory strategy, improve their supply chain competencies, and minimize the loss of perishable foods.

Table 1

Tactics Used to Implement Inventory Strategy

Key tactics used	Percentage used
First-in, -first-out (FIFO)	100
Rotation	100
Replenishment	100

All participants noted that the fresh inventory arrives daily. P1 stated, "It is essential to use the FIFO inventory process and order just enough to get through each days of business." P2 stated, "Inventory accuracy is needed to ensure ordering of the products." All participants eluted to stocking the sales floor with existing products before using the new products. P3 emphasized the need of the backroom and the cooler for replenishment of the sales floor before using that day's products. This finding confirms the research of Chiralaksanakul, Sukhotu, and Thailand (2017), who noted the replenishment process as a means for controlling inventory and product handling from the backroom to the sales floor. I reviewed each retail stores' inventory guidelines and

policies to confirm the interview data collected from the participants. Following the inventory guidelines, the managers rotate perishable products daily, placing the new product on the bottom or back shelves while ensure the older product is on the top or front shelves. P4 acknowledged that product rotation plays an important role in maintaining inventory. P5 and P6 noted that they use replenishment as a tool to measure inflow and outflow of products to the store. This finding confirms the research of Aktas and Meng (2017) in that frequent replenishment is an effective strategy for inventory management. Five participants used frequent replenishment to ensure the availability within their stores to meet customer demand.

Sampat and Nisha (2017) noted that FIFO is a process supply chain managers use to control inventory. All participants used the FIFO inventory process to reduce food waste, improve the quality of the food offered, and reduce the cost associated with perishable food waste. This finding confirms the research of Sampat and Nisha in that the FIFO method is a vital process for managers in the retail grocery business to use to reduce perishable food deterioration, reduce cost, and ensure food safety. I reviewed production reports, inventory control worksheets, and sales reports to validate the data collected from the participants during the interviews. The production reports and inventory control worksheets contained information regarding product movement from the wholesale warehouses to the stores, what products were available, and the age of each product. The sales reports contained documentation regarding customer purchases of individual products; therefore, supply chain managers could reorder the products needed

to ensure adequate supply to meet the projected demand. P4 stated, “We use the production reports, inventory control worksheets, and sales reports to forecast future demand. We do not want more product than needed, but we do try to have everything in stock that the customers want.” P5 noted that maintaining the reports and worksheets takes time and effort, but the documents serve a valuable purpose for reducing perishable food loss. P6 noted that the process of tracking perishable food is a good beginning but requires consistent and constant monitoring and reassessing to ensure the FIFO inventory process occurs. All of the participants emphasized the importance of using the FIFO method to minimize perishable food waste.

Supply chain managers must understand their customers’ demand, inventories in the backroom, cooler, and sales floor for operational planning and replenishment of the products. This finding confirms the research of Krichanchai and MacCarthy (2017) who noted that supply chain managers should consider inventory control and replenishment process before agreeing to stock the product. Inventory control and replenishment is a process supply chain managers use to eliminate product stock-outs, replenishment problems, and over-stock to meet demand. The findings align with Nahmias’ (1982) perishable inventory theory in that effective supply chain managers offer solutions to perishable food loss, engage in successful management of perishable food practices, and improve the sustainability of their supply chain from the farm to the consumer.

Theme 2: Logistics Strategy

Logistics and deliveries of the products from the warehouses to the stores are major factors in the reduction of perishable food loss. The participants used refrigerated trucks, warehouses, backroom coolers, and retail shelves within their logistics strategy. In addition, five of the participants replenished the stock based on sales and used multiple daily deliveries to reduce perishable food loss. Table 2 displays the tactics the supply chain leaders used to implement their logistics strategy.

Table 2

Tactics Used to Implement Logistics Strategy

Key Tactics Used	Percentage used
Refrigeration	100
Trucks	100
Warehouse	100
Backroom coolers	100
Retail shelves	100
Multiple deliveries	80
Replenishment based on sales	80

All participants noted the need for refrigeration from the warehouse to the retail shelves to reduce perishable food loss. P1 stated, “Every minute out of refrigeration will decrease the shelf life of a product.” As noted by all the participants, the efficient transportation and delivery of perishable products to the stores is the key to the store meeting their customers’ demand and staying in business. P2 and P6 mentioned that reducing the amount of time the perishable products are out of a refrigerated environment is essential to minimizing perishable food loss. This finding confirms the research of

Madhani (2017) in that supply chain managers of perishable foods must ensure adequate refrigeration of the products to ensure an efficient delivery and quality of the food products.

Five of the six participants used multiple daily deliveries of perishable food to reduce deterioration and improve the quality of the products on the retail shelves. P2 noted multiple daily deliveries as a tactic used to keep perishable inventories to a minimum and improve product freshness and safety. P4 stated, “I order fresh produce in the morning and the afternoon to ensure the freshest products are on the shelves.” P3 and P5 noted the importance of ordering based on consumer demand, striving not to order more product than needed each day, yet ensure the availability of adequate perishable inventory. I reviewed inventory control documents, perishable food sales and reorder reports, and sales projection reports to confirm the interview data. This findings confirms the research of Gadde and Amani (2017), who noted that minimizing perishable food waste is a function of supply chain managers ordering in small batches multiple times each day to avoid overstock.

P1, P2, P3, P4, and P6 noted the use of automatic distribution; a replenishment process that supply chain managers use to order new product based on daily sales. The five participants’ companies use computer-based sales registers that result in a continuous flow of sales information that the supply managers use to reorder products each day. P1 and P3 noted the need for *hands on* verification of the automatic replenishment report. P4 stated, “When there is coordination between logistics, the sales information, and the

actual inventory, replenishment orders improve.” P6 noted that using sales’ history from the prior days’ sales is an effective means to determine what products and how much product needs ordering. The five participants using the automatic replenishment process noted that the procedure is not perfect, but does result in an improvement of their ability to ensure adequate perishable food inventory remains in stock. I reviewed automatic replenishment reports to confirm the interview data collected from the five participants who used the automatic reordering process. This finding confirms the research of Salm, Panahifar, and Byrne (2017) who commented that the order and delivery process regarding perishable foods improves when supply chain managers use historic sales data as a factor for reordering products and meeting customer demand.

All participants mentioned the challenges associated with perishable food logistics and deliveries. P2 and P5 referenced the challenges regarding late deliveries and out-of-stock issues, noting both problems affect their ability to meet consumer demand. P4 elaborated on the challenges associated with ordering adequate inventory, noting that oftentimes, when the order arrived, the amount of product would be short of the amount ordered. P5 stated, “When the truck arrives late, we lose the ability to place the products on the shelves during the times of highest customer demand. Then, the product sits on the shelf until the next day.” P1 commented that proper ordering of perishable products is a challenge in that projected sales seldom match actual sales, resulting in either excess products or shortages. P6 noted the need to use frequent inspection and assessment of

amount of products and the quality of the products offered on the retail shelves to recognize how much product to order.

I reviewed order-to-budget documents, such as estimated cases to order, actual cases ordered, and actual cases received to confirm the interview data. After reviewing the documents, I confirmed that oftentimes, the amount of product ordered did not match the amount of product received. Additionally, oftentimes, the estimated actual time of delivery was later than the estimated time of delivery. P5 stated, “Using present history and past history of sales is the information I use to know how much product and what types of products to order, yet the process is still a significant challenge.” This finding confirms the research of Zhang, Zhao, and Qian (2017) who identified logistics as a source of degradation of perishable food. Zhang et al. (2017) added that the desire of supply chain managers in the perishable food industry to meet customer demand oftentimes results in excess product on the shelves resulting in higher losses. These findings align with Nahmias’ (1982), who noted in the perishable inventory theory that integration and collaboration between retailers and supplies is the key to proper replenishment of perishable products to the stores.

Theme 3: Information Technology Strategy

Information integration in supply chain management is a proven means to enhance the effectiveness and efficiency of the perishable food supply chain (Nakandala, Samaranayake, Lau, & Ramanathan, 2017). All participants in this study agreed that the use of an IT strategy is an essential component of their overall strategy for procuring and

retailing perishable food products while minimizing losses. All participants agreed that information integration is useful in purchasing and coordination with suppliers. This finding confirms the research of Aktas and Meng (2017) who asserted that using an IT as a strategy to compile of data in retail grocery stores is a means for supply chain managers to increase their competitive advantage and improve profitability by up to 60% annually. Table 3 displays the IT integration and information sharing among the retail business' supply chain. The table displays the users and the process involved in using their IT strategy to minimize perishable food loss.

Table 3

<i>Type of Information Technology</i>	
User of technology	Process
Distribution	Process orders
Purchasing	Coordinating with suppliers
Retailers	Ordering to meet customers' demand
Suppliers	Coordination with buyer/distribution

P1 stated, "Different times of the year present different sales patterns and we are able to look back at history to determine sales volume and forecast. We need real-time information." All participants mentioned the use of technology for sales reports, product movement, and ordering. P2 agreed that use of IT is critical to meeting customer demand during holidays and seasonal changes. All participants agreed on the important of using an IT strategy. This finding confirms the research of Gadde and Amani (2017) and Nakandala et al. (2017) who indicated that retail business involves different stakeholders that need information integration to make sure products and other aspects of organization

function successfully. This finding confirms the research of Aktas and Meng (2017) who noted that IT is an integral part of supply chain managers gathering and recording data.

Information sharing has played an important role in perishable food supply chain (Devin & Richards, 2018; Gadde & Amani, 2017; Nakandala et al., 2017). All participants in this study used information sharing for coordination, distribution, purchasing, and training. Nakandala et al. (2017) noted that information integration is a means for supply chain managers to make information visible, accessible, and useful. P4 mentioned the use of IT for known-loss reports and shrinkage reports. P3 stated, “We use information technology for monthly status and overbuy documents, inventory shrinkage reports, sales reports, and budgets.” P5 emphasized the value of using an IT strategy to recognize under buying, overbuying, sales projections, actual sales, and perishable inventory losses. I reviewed monthly status and overbuy reports to confirm the participants’ responses. The monthly status and overbuy reports display daily and weekly sales, period ending inventory variances, and known losses of perishable products.

P6 noted the importance of technology in the daily work of a perishable food manager. P6 stated, “The use of technology has increased the ability of the organization to identify variety of ways to reach our customers and how to serve them either online or in the store.” P4 commented on the value of real-time information, noting that obtaining daily information was essential to reducing perishable food loss. This finding confirms the research of Gadde and Amani (2017), who noted that the of adaptation of IT within the perishable food supply chain is an effective means for supply chain managers to

minimize perishable food loss, reduce overbuying, and invoke stricter controls on perishable inventories. These findings align with Nahmias' (1982) perishable inventory theory in that supply chain managers need to use IT as a strategy to improve supply chain visibility, information sharing, and real-time information to engage in proper ordering, distribution, and inventorying of perishable foods. Supply chain managers found information integration between all departments an effective way to minimize perishable loss (Nahmias, 1982).

Summary of the Study Findings

Supply chain managers in the retail grocery industry who participated in this study use an inventory strategy, a logistics strategy, and an IT strategy to minimize perishable food loss. These three emergent key theme strategies are the answer to the overarching research question of this study. The findings of the study confirmed the research of other researchers regarding the need for effective strategies to reduce perishable food loss. The supply chain managers used a variety of tactics to implement their strategies, such as the FIFO inventory method, product rotation, automatic replenishment, multiple daily deliveries, refrigeration, and information sharing among distributors, suppliers, and purchasers. The findings of this study align with the perishable inventory theory originated by Nahmias (1982). The key constructs and propositions underlying the theory are perishable management procedures, supply chain procedures, IT management, and sustainability practices. The findings of this study indicated that supply chain managers use an inventory strategy to manage their perishable

management procedures, a logistics strategy to manage their supply chain procedures, and an IT strategy to manage information flow and collaboration among supply chain partners. The use of all three strategies by supply chain managers resulted in reductions in perishable food loss and improved sustainability practices.

Applications to Professional Practice

Effective supply chain managers in the retail grocery industry give significant attention to reducing perishable foods waste, yet approximately 50% of food produced globally is wasted (Gadde & Amani, 2017). Lin, Chen, and Kawamura (2016), Pullman and Wikoff (2017), and Salm et al. (2017) amplified that minimizing perishable food loss is a key driver of profitability, food quality and safety, and the ability to meet consumer demand. The ability to secure food products grown or produced in different parts of the world is a challenge for grocery retailers (Gadde & Amani, 2017). Based on data collected through interviews and a review of relevant documents, the findings of this study indicate that inventory control, logistics and delivery, and IT are vital strategies for supply chain manager to use to minimizing perishable food loss. Supply chain managers might use the finding of this study to increase their knowledge and use of effective strategies to reduce perishable food loss.

Supply chain managers might apply these findings to improve the use of the FIFO inventory process, improve product quality, and ensure meeting customer demand. Perishable inventory control is the concern of supply chain managers and a most challenging aspect of the retail grocery business (Krichanchai & MacCarthy, 2017).

Krichanchai and MacCarthy (2017) noted that vendor management inventory system (VMI) is a collaborative and information sharing method used by suppliers and retailers to control inventory. Supply chain managers might use VMI for a better understanding of sales data, thereby allowing better demand forecasting, inventory reduction strategies, increased inventory replenishment, increased customer satisfaction, and increased profitability. Salm et al. (2017) noted the need for supply chain managers to use reliable, timely, accessible, and accurate information to control and minimize waste of the inventory.

Supply chain managers might apply these findings to realign the organizational focus with perishable product safety, effective logistics, and better replenishment of products on the store shelves. Logistics and delivery of products are strategic objectives of supply chain managers to ensure product availability from production on the farm to the retail stores (Lin et al., 2016). Retail grocery store owners and managers might apply these findings to improve their logistics strategy, attain their organizational goals, and meet customer demand. The application of these findings might result in improved distribution, transportation, and storage of perishable food products. The integration of supply chain networks of local food producers, suppliers, distributors, customers, and community stakeholders might result in lower perishable food losses, increased profitability, and lower consumer prices. The integration of local food producers in the supply chain tends to result in minimizing deterioration of perishable foods (Lin et al., 2016).

Supply chain managers implementing the finding of this research might improve their information visibility, information sharing, and supply chain collaboration using an IT strategy. Communication and information sharing are essential aspects of effective supply chain management (Salm et al., 2017). Nakandala et al. (2017) noted that integration of technologies and information have emerged as key dimensions of an efficient supply chain in which managers reduce perishable food loss. Supply chain managers who apply the findings of this study might improve their inventory controls and logistics by implementing an IT strategy or upgrading their IT capabilities. Madhani (2017) noted that the successful transportation, delivery, and storage of perishable food products are functions of effective information integration and collaboration of all supply chain partners. The findings indicate that organizational managers will improve the supply chain using IT within the financial, operational, and marketing aspects of the business to improve cooperation, collaboration, and communication throughout the perishable food supply chain.

Implications for Social Change

The most critical factors regarding improved customer service in the retail grocery industry are product availability and product quality (Salm et al., 2017). Supply chain managers might use the finding of this study to ensure a variety of quality products is available to meet customers demand. In the competitive environment, inventory and service are concerns of the supply chain managers in establishing an inventory system that results in a reduction of perishable food loss (Krichanchai & MacCarthy, 2017). The

improvement of an inventory system might result in reduced cost of food, reduced perishable food loss, and increased value and quality of the products purchased by customers.

Innovative logistics strategies applied by grocery business owners and managers, such as establishing distribution centers closer to their stores, results in higher quality perishable products and reduced cost to the business as well as the consumer (Krichanchai & MacCarthy, 2017). Supply chain manager who integrate distribution, transportation, inventory control, and IT could reduce losses associated with perishable food products, improve the quality and safety of the perishable products, and lower the cost of stocking perishable products. The improved use of IT regarding inventory, transportation, and delivery of perishable products might result in reducing food product recalls, improving the tracking of foods from farms to the consumers, and reducing the probability of consumers purchasing contaminated or deteriorated food. The findings of this study might contribute to positive social change through the reduction of perishable food loss, increased supply of food, lower retail prices to the consumer, and improved customer satisfaction.

Recommendations for Action

Mitigating perishable foods loss is a significant problem for supply chain managers in the retail grocery business. Leaders in the retail grocery industry use logistics, distribution centers, and effective supply chain management to gain and maintain a competitive advantage. As customer satisfaction remains a target for the retail

grocery business, a need exists for the leaders to ensure that product availability coincides with customer demand.

To improve inventory management and customer service levels, I recommend supply chain managers ensure appropriate levels of inventory stock to meet consumers demand. I recommend having additional inventory depending on the size and sales of the store to increase product availability especially those items on promotion. To maintain appropriate inventory and keep availability of variety products, I recommend supply chain managers double check the backroom inventory, ensure sales items are ordered, check the out-of-date products on sales floor, and order according to customer demand.

To maintain effective logistics supply chain management, I recommend the organizational leaders establish or build distribution centers close to the stores to facilitate smooth delivery and reduce transportation cost. I recommend that supply chain managers organize a system to address out-of-stock items and correct orders' writing to make a second delivery to meet sales. I recommend effective maintenance of transportation trucks to reduce late deliveries and reduce cost.

Supply chain managers remain concerned about the risks of integrating IT capability with the supply chain network. I recommend retail grocery businesses join force in building IT systems with suppliers because buyers and suppliers benefit from improved IT visibility. Eliminating information uncertainties that exists on closely held information is essentials in the retail grocery business. I recommend using a risk mitigation strategy to avoid the dissemination of proprietary information and avoid

allowing suppliers to control purchasing and inventory decision to help minimize the risks. The inefficiencies are apparent during customer demand forecasting. I recommend organization leaders pool their resources to create a collaborative information-sharing network. I recommend supply chain organization implement collaborative planning, forecasting, replenishment, and VMI systems with partners to enjoy the benefits of supply chain information forecasting on demand, costs, and inventory reduction.

Researchers should publish their findings in academic and professional journals to improve the dissemination of their results (Yin, 2018). I hope to apply my knowledge to the scholarly literature in the areas of SCM and retail grocery business. Therefore, I seek to contribute to the existing body of knowledge through scholarly writing. I intend to submit to articles for publication to the following peer-reviewed journals: *International Journal of Retail and Distribution Management*, *International Journal of Logistics Management*, *Journal of Supply Chain Management*, and *International Journal of Business Research*. Additionally, I will like to present the findings of the study at the *Annual International Retail Grocery Industry Conference*.

Recommendations for Further Research

The purpose of this study was to explore strategies that supply chain managers in the retail grocery business use to minimize perishable food loss. The findings of this study emanated from the data obtained from six supply chain managers in Pennsylvania in the retail grocery industry. I recommend further research to overcome the limitations of this study. Future researchers should consider conducting a multiple case study

regarding minimizing perishable food loss in other geographic regions to test the transferability of the findings of this study. A future researcher might consider conducting a quantitative correlational study to test relationships among variables, such as delivery time, number of product rotations, percentage of loss of perishable food, food quality, and customer satisfaction in the retail grocery industry. A researcher conducting quantitative research on perishable food would result in generalizable findings to a larger population that this study lacks.

I recommend future researchers incorporate all grocery products within the supply chain to extend this research beyond perishable food. Future researchers could use a large sample of supply chain managers from dispersed locations to collect data from a broader representation population within the retail grocery industry. A larger sample population might result in a researcher gleaning additional data and overcoming the limitation of a small sample size in this study. Future researchers might consider adopting a mixed-method approach to conduct a more in-depth investigation regarding minimizing perishable food loss in the retail grocery industry.

Reflections

The opportunity to leave my family in African and to move to the United States at a young age is why I never let any obstacle deter me from my goals in life. My experiences in the field of management, retail, and the different ways of conducting business in the United States induced my desire to seek higher education in the field of management. Working in the retail and food industry, I was amazed to see how much

waste occurs regarding perishable food in the stores or from the farmers. Furthermore, logistics and distribution practices caught my attention to seek to understand why some organizations excel in integration and delivery and some do not. Another aspect that peaked my interest in exploring perishable food loss was the amount of food wastage while many people are going on hungry.

I began the research with the thought of why managers in the retail grocery industry discard food instead of donating the products to people in need. I now recognize that managers of perishable foods must abide by government regulations regarding the safety of their food; therefore, much of the wastage is not suitable for donation to organizations that serve hungry people. The experience of the doctoral research was more than exciting, and I would like to engage in further research. I would like to use the experience gained during this research study to engage in projects to help reduce perishable food loss and distribute the food to nonprofit organizations.

Conclusion

In this study, I focused on the strategies supply chain managers use to minimize perishable loss. The findings indicated that supply chain managers use an inventory strategy, a logistics strategy, and an IT strategy to minimize perishable loss. Food waste is a significant problem and has a negative impact on the performance of all levels of supply chain management within the retail grocery industry. Leaders in the retail grocery industry rely on an effective and efficiency supply chain. The perishable inventory theory developed by Nahmias (1982) was the conceptual framework for the study. The purpose

of this multiple case study was to explore strategies that supply chain managers in the retail grocery business use to minimize perishable food loss. I collected data from six supply chain managers in the retail grocery business in Western Pennsylvania. I used member checking, Yin's (2018) five-phase cycle of data analysis, and NVivo 12 for data transcription and organization. Organizational leaders and supply chain managers might use the findings and recommendation from the study to improve inventory management, logistics, IT, and profitability. The findings of this study might contribute to positive social change through the reduction of perishable food loss, increased supply of food, lower retail prices to the consumer, and improved customer satisfaction.

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Appendix A: Interview Questions

Research Question:

What are the strategies that supply chain managers in the retail grocery business use to minimize perishable food loss?

Interview Questions

To better understand the strategies that supply chain managers in retail grocery business use to minimize food loss, I will conduct in-depth, semistructured interviews of supply chain managers in retail grocery business using the following interview questions:

1. What strategies do you use to minimize perishable foods loss?
2. What transportation strategies do you use to minimize perishable foods loss?
3. What inventory strategies do you use in reducing perishable food loss?
4. How do technologies and information systems assist in implementing strategies to reduce perishable food loss?
5. What key challenges did you face in implementing strategies to minimize perishable food loss?
6. How did you overcome the key challenges in implementing strategies to minimize perishable food loss?
7. Is there other information regarding strategies to minimize perishable food loss you might offer that I did not ask?

Appendix B: Interview Protocol

Interview: Exploring the strategies that supply chain managers in retail grocery business use to minimize perishable food loss in Western Pennsylvania.

- A. I will obtain informed consent from the participants through them replying “I consent” to the Invitation to Participate email to which I attached the informed consent form.
- B. The interview will begin with me introducing myself to the research participant, followed by explaining the research topic.
- C. I will thank the participant for agreeing to participate in the study.
- D. I will ask if the participant has additional questions before proceeding by quickly reviewing the informed consent form with the participant. The items included in consent form are: (a) the expected length of time to participate in the interview; (b) the interview will be audio recorded and if a participant chooses not to be recorded, handwritten notes will be taken; and (c) a summary of the interview will be presented to each participant to validate my interpretations of their responses to each interview question.
- E. I will explain that participation is voluntary, and they can withdraw from the study at any time without prior notice and through a verbal or email request, even after the completion of data collection.
- F. I will provide my contact information to each participant in case he or she decides to withdraw from the study.

G. I will use a sequential coding system to identify the participants during the interview recording without using their names. For example, I will assign each participant an identifying pseudonym, such as A1, B1, and C1. I will explain that I will be the only person with access to the name of each participant associated with each pseudonym and that data from their interview will be identified in my database using only their assigned pseudonym.

H. I will audio record the semistructured interview, after the participant signs a consent form and begin with open-ended questions, which may include probing questions to expand on the participant's response.

I. At the end of question period, I will remain the participant that I will provide him or her with a summary of the interview and my interpretation of their responses to review and validate.

J. At this point, I inform each participant that I will request copies of study related documents such as schedules, charts, and internal records related to third-party logistics services from an authorized representative of the company.